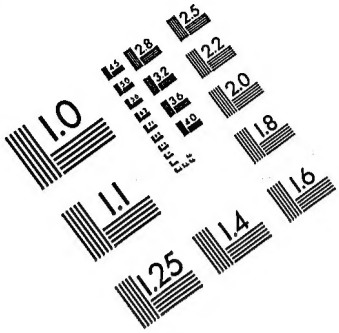


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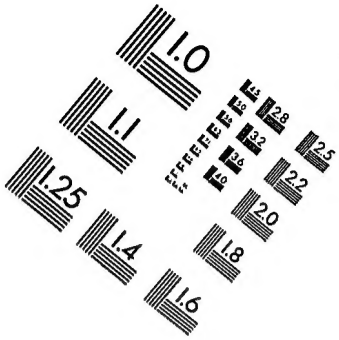
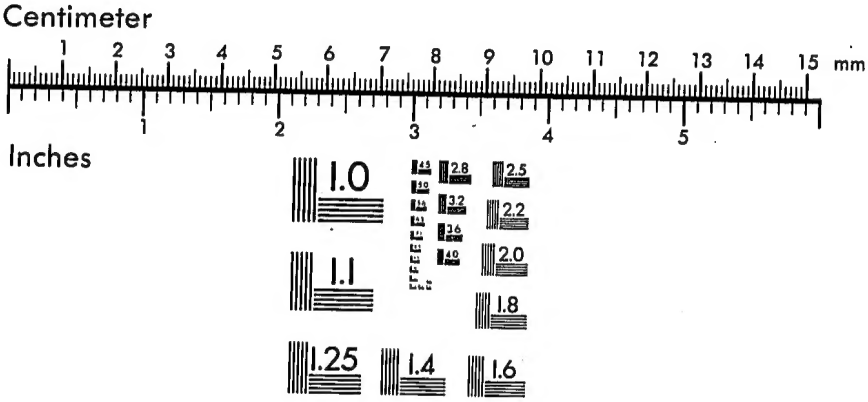
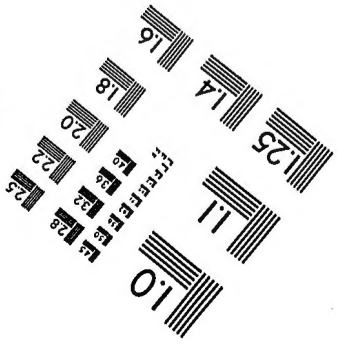
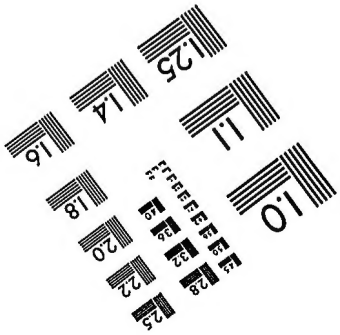



Centimeter
Inches
mm





Thomas A. Edison Papers

A SELECTIVE MICROFILM EDITION

PART I
(1850–1878)

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6

START

A Note on the Sources

The pages which were microfilmed for this collection are in generally good condition in the original. There are some pages, however, which due to age are lighter than normal. Additionally, because some volumes are very large and have been bound tightly and cannot be unbound, there are intermittent occurrences of slight distortion of the edges of a small percentage of the pages. We have made every technical effort to ensure complete legibility of each and every page.

Laboratory Notebook, Cat. 1176

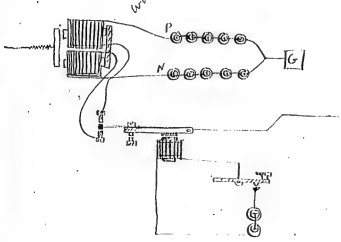
This notebook contains only a few dated entries, covering the period April 1873-November 1874. It is entirely by Edison and relates to telegraphy. Pages 1-55 contain notes and drawings of Edison's and other inventors' telegraph devices. They may have been intended for use as illustrations to accompany Edison's essays on telegraphy and electricity (see NS-74-002, Unbound Notes and Drawings). There is one dated entry (page 53) for April 17, 1873. Pages 57-63 contain notes and drawings on duplex telegraphy dated September 10-12 and November 2, 1874. Pages 64-66 contain Edison's drawings and notes on what Ezra T. Gilliland remembered, probably in 1875, about H. Nicholson's work on multiple telegraphy during the early 1870s. The book contains 320 numbered pages.

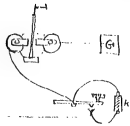
Blank pages not filmed: 67-320.

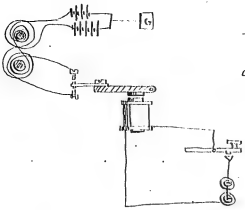
Duplex.
Repeater
Fac Similes
Dot & Dash Chemical "Autos"
Magnetic Autos
Telegraph Inductive & discharge Currents.
Printing Instruments,
Transmitters for do.
Perforating Machines.
Relays
Sounders.
Morse Recording units.
Movements,
Application of Magnetism
" " Electricity
Mechanical Electric Movements
Magnetic Telegraphy
Induction Coil Telegraphy
Contracts
Batteries,
Local Connections,
Manipulations Local,
Electromagnetic Engines

Duplex. Stearns – get copies Patents =
" Farmer " " " Extension & Reissue,
" Siemens & Halske = Kramer, get copy Leipzig giving description =
Edisons. as shown in telegraphy
Merlin Farmers Clockwork Double Trans
" Edisons Magnetical do same principle
recent Bastian Experiments
Have Double transmitter Article in
Dub, Schellen & Blavier Du Moncel
Translated =
Edisons No. 1 on Telegraphy
Edisons No 2 Vibratory
Edisons No 3 Mechanical Equalizer.
" No 4 Short with Rev. Bat. dep
on single relay
Reverse Current one & measure & measure
other =
Double trans Chemical
Wheat in Connection
~~see~~ Condenser Application by Edisons
and other means such as a Condenser
of a double Coil. No Condenser but
Extra Coil or relay to take induction
also to short Duplex relay with
water Resistance =

2 Duplex.

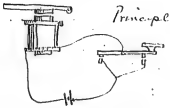






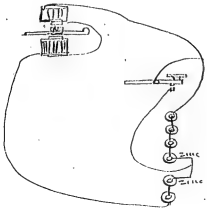
Man you cannot
receive a current through
an electro [illegible]
without opening it.

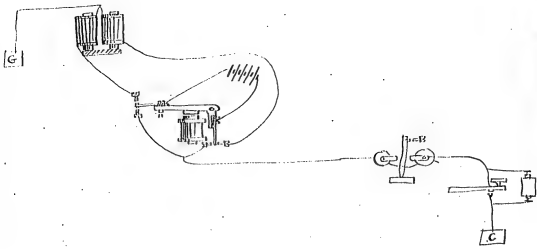
yes but you can
~~make~~ let it open
if you fix it
[illegible]
for [illegible]

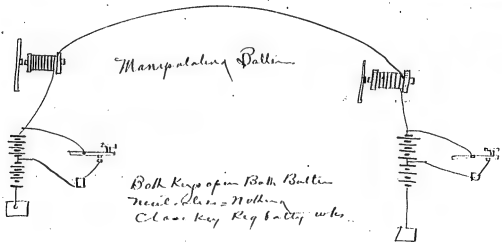


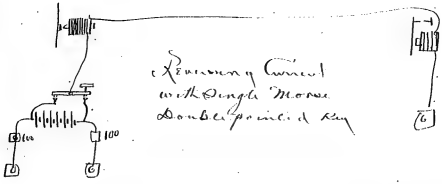
Principle =

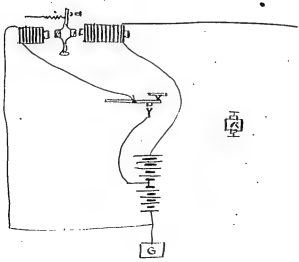
Running a Battery without ~~much~~ mechanism
a Morse Key in a Circuit

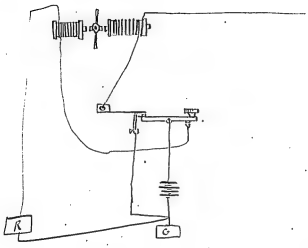




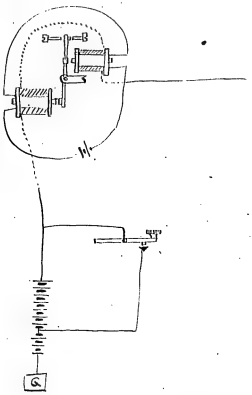

Manipulating Battery
Both Keys open Both Batteries
Neutral Class = Nothing
Close Key Reg battery wks


Permanency Current
with Single Morse
Double pointed Key
100
100

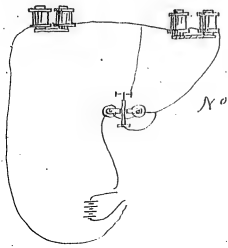

G

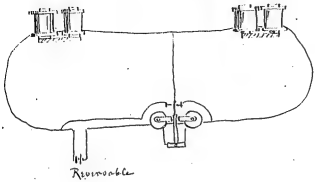

R
C

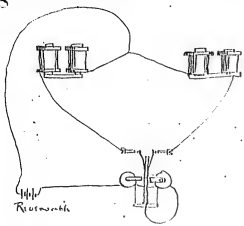
6

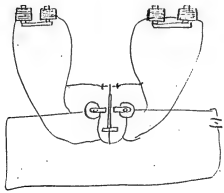


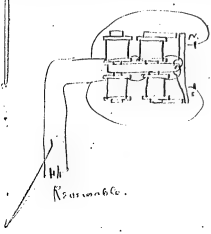
Polarized Switches

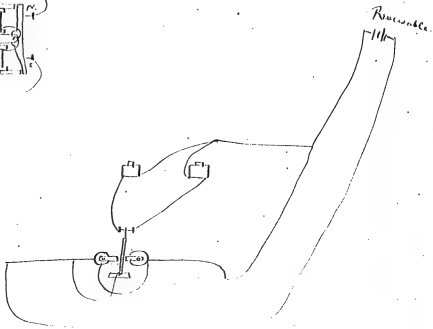


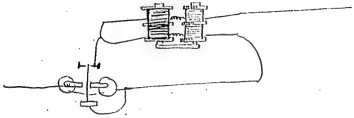


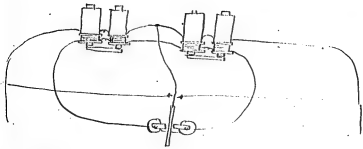

Receiver




Rheostat.

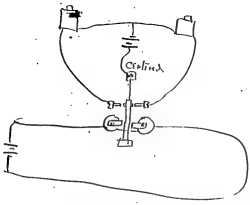

Rheostat.

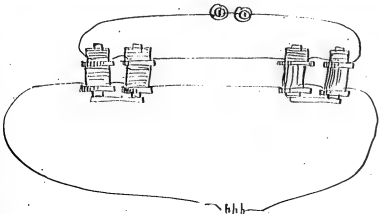




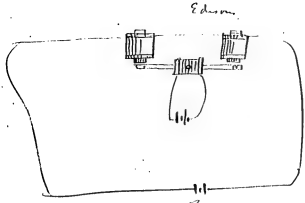
Polarized Relay worked by induction from Extra Coil.
Its direction of the current generating right induction
to block.

'1'

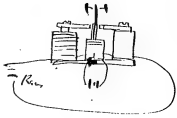




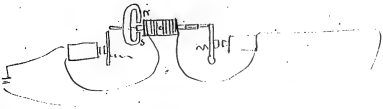
Reversable.

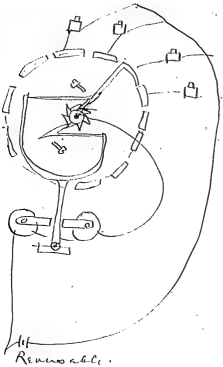


Reversable

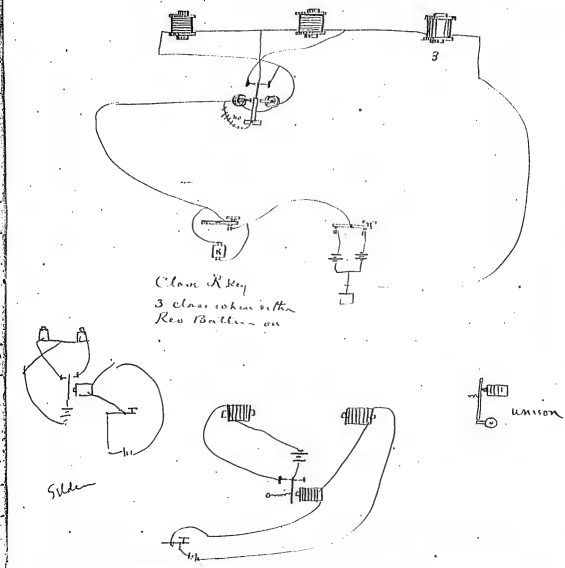


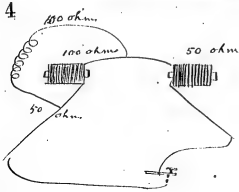
Lock



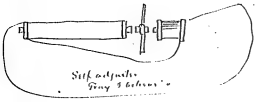

Removable.

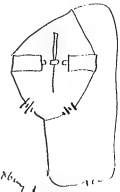
3 motion one wire.





Equalizing unequal magnets.

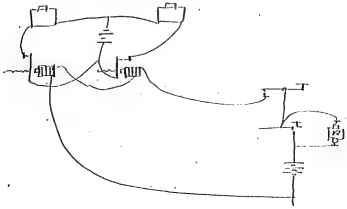


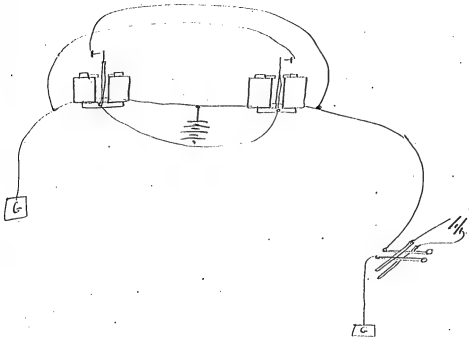


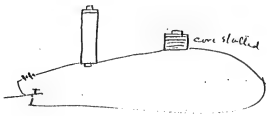
Dudley & Rockwell, see Page

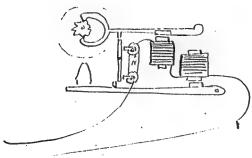
get out of Duranti Self adjust

see Page

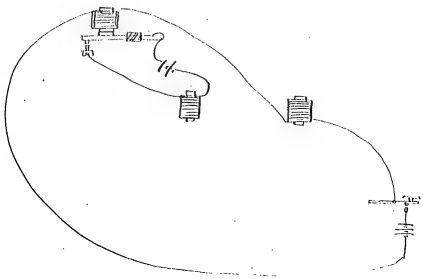


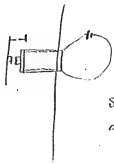

G
G


Broadside aerial
aerial installed



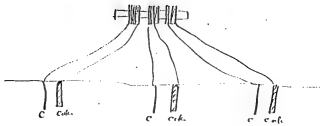
Residual



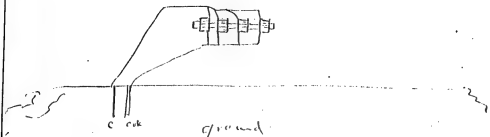


"of"
slight current to make magnet
discharge quick

Explain about Small Type Wheels
advantages over large wheels used
before they were enlarged



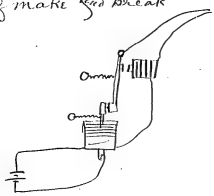
Ground Battery made of [illegible]

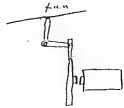


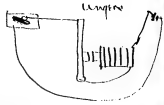
Getting Intensity by means of magnets

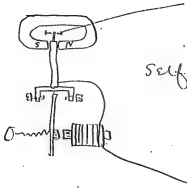
Relay with no armature

Self make and break

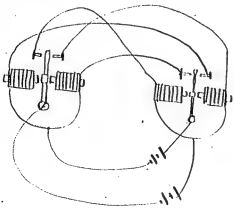




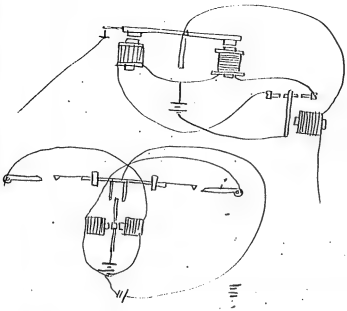




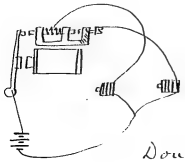
Self-make and break



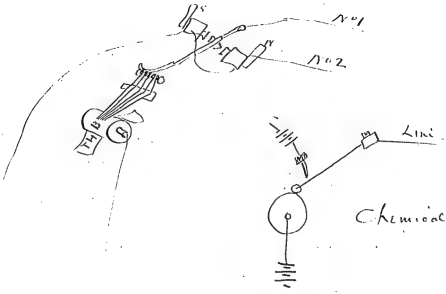
Self actor. slow & steady

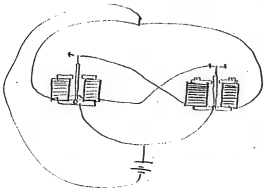


McCrackens alternating Bulling &
Edisons Ink Recorder –

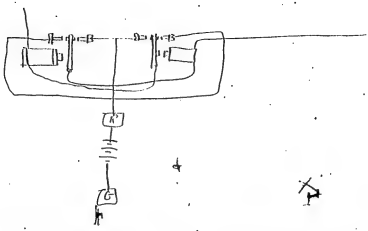


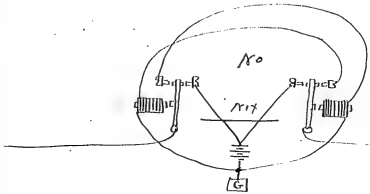
Double movement one closes first
or weak current one shuting out
cuts both –

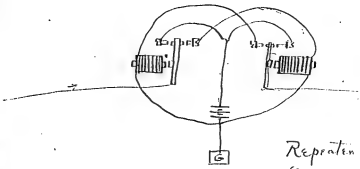




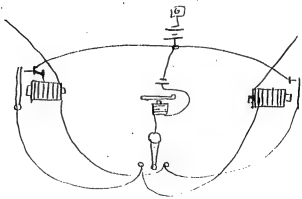
Movement



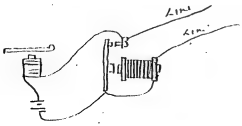


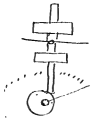


Repeater used on Europe
Lines



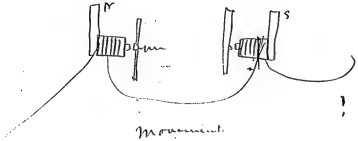
Edwin Bullock Repeater



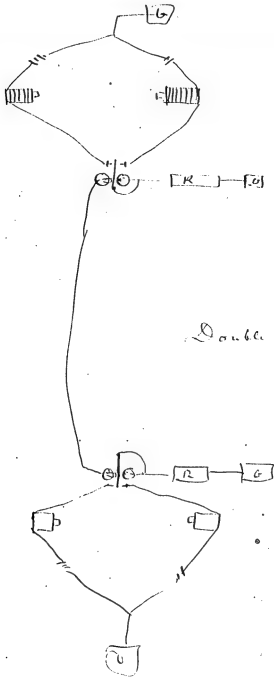


Reversing Mechanism

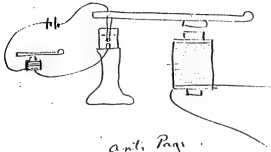
Mention Sounding an Magnet



Movement.



Double Vibrating Trans



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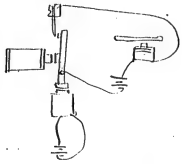

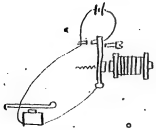

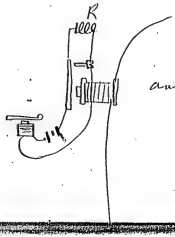

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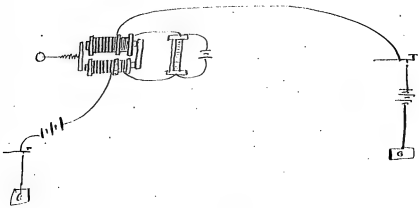
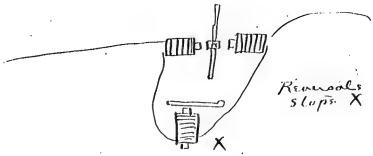
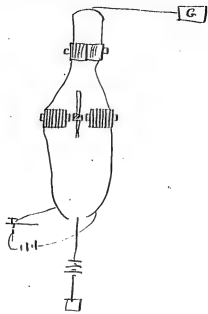
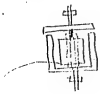
Paper

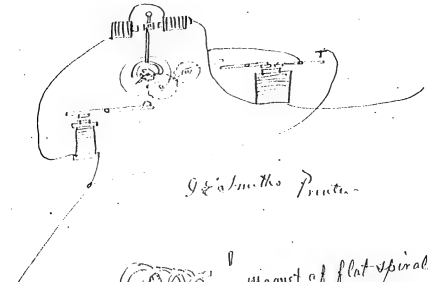

a
c


Removable
slips X
X


G



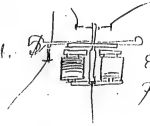
Ordinary Magnet applied to Gallaghers Printer.



Gilmore's Printer.

Magnet of flat spiral

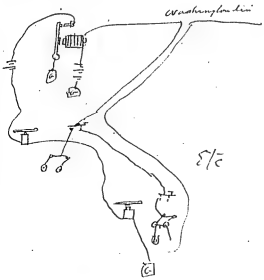
Cable Magnet.

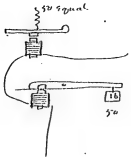


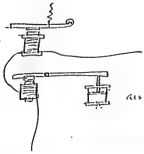
Edison's Polarized Electro.

Dont commence
so much to me
1/2 been just as well.

Jos said that smooth
wire same size weight &
number turns


Washington line
E/C
C


50 equal
16
50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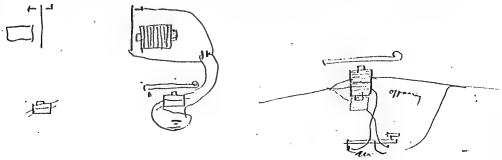
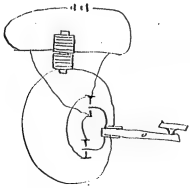
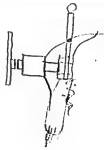
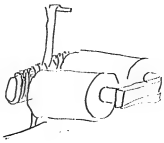


Repeater

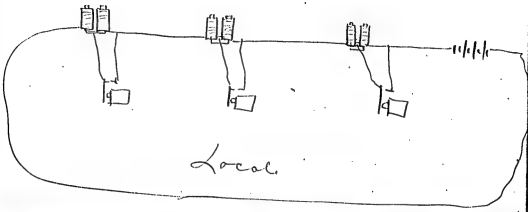
Hix No 1. 2.
Milliken
Farmer
Proper Book — Edison at Trial & then
pennied — Brunnell.
Gray & Barton.
Clark
Varley
Ericsson
Face.
Hawkins
& all Edison can get



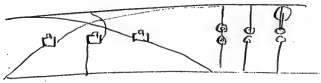




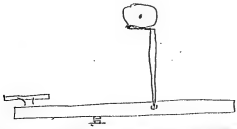
No iron

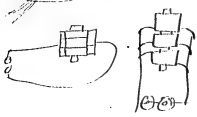


Local



The best form self closing key probably attachment small dinner which would keep permit away when key operated but close in few seconds





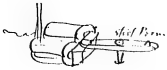
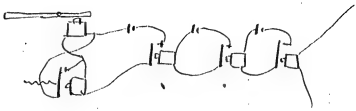
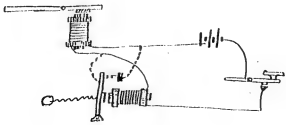
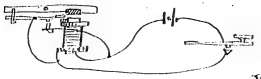
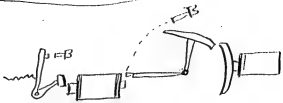


Fig. 6

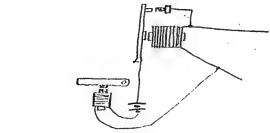


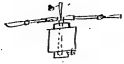


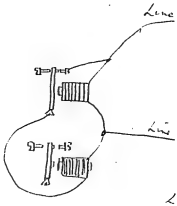


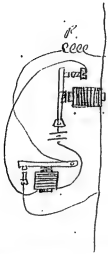


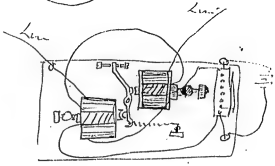
Tremendous Bolling discomposes water on
[illegible] under lime ok –

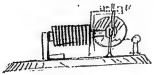


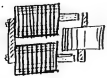


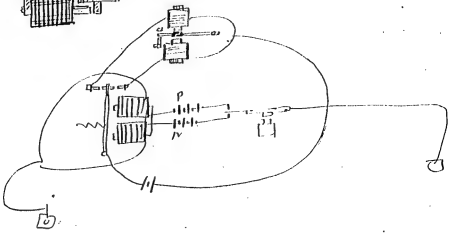


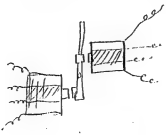


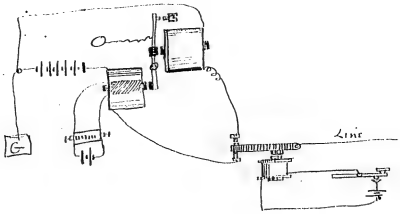


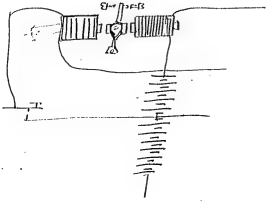


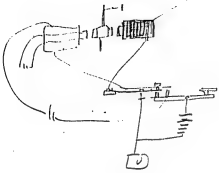


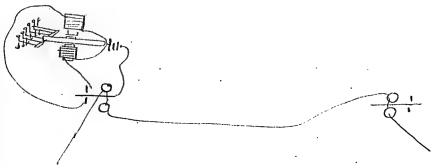


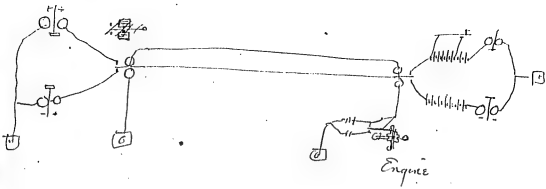



G
Line





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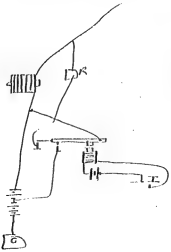
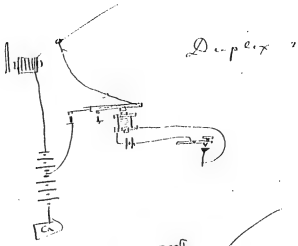
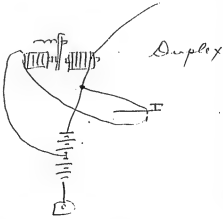
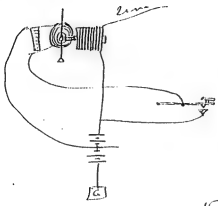
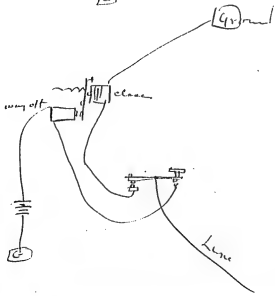

Duplex

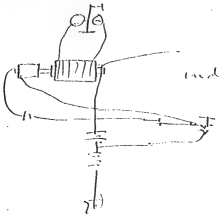

Duplex


Duplex

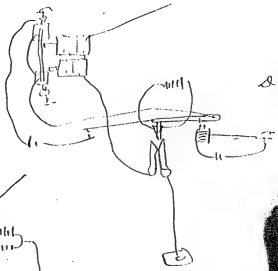


Duplex

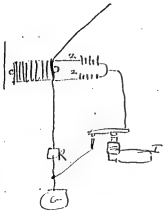




induction Duplex



Duplex.



Duplex

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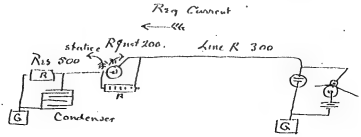
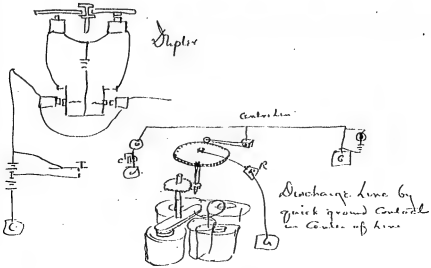
Edisons system of Cables. working by Centre of resistances and static accumulator

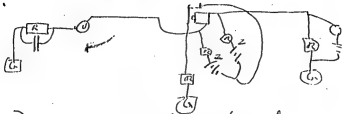


This system gives perfect work between New York and Washington at 1600 words per minute

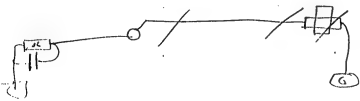
Experiments to be tried to lessen the resistance of the artificial line —

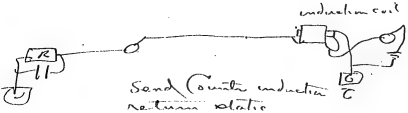
Still later 3180 words per minute readable =

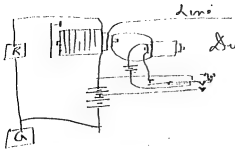


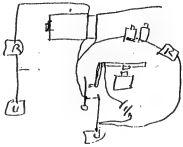


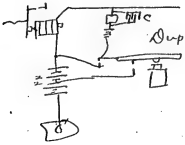
Repeat in chem bilgh to get morse sequel through and throwing line direct when "rec."

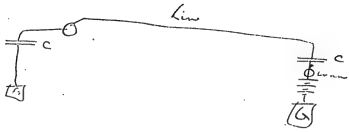


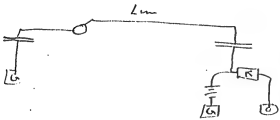

induction coil
Send Counter induction
neutrum static
C

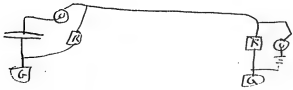

Duplex neu static

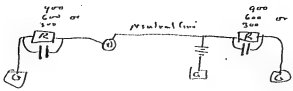


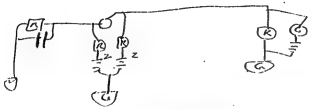

Duplx static

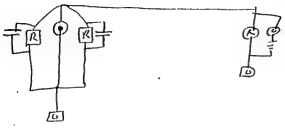

Line
C
C
R
G


Line
C
R
G
O

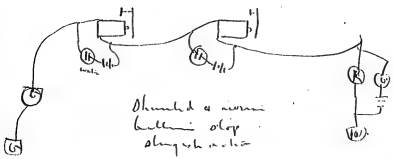

O
R
G
R
O
G





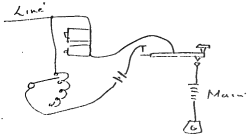

R
R
G
R
G
D

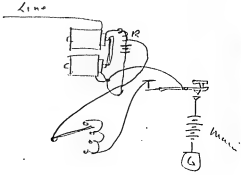

R
G
R
Big R
G
D

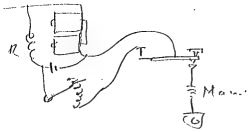

B
B
G
R
G
W

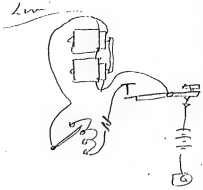
Escape compensated Relay

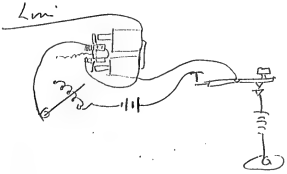
No 1

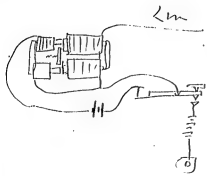


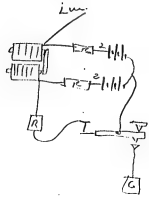


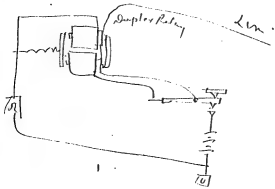


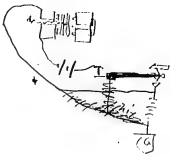


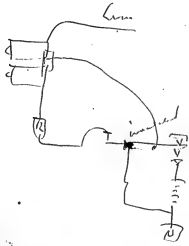


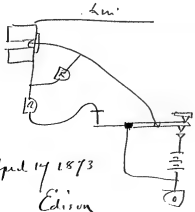

Lm
T
V
G


Lm
R
T
V
G


Duplex Relay
Lm
R
T
V
G

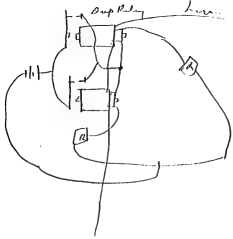

T
V
G

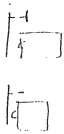

Lm
R
T
V
G



Same dynamo

Duplex





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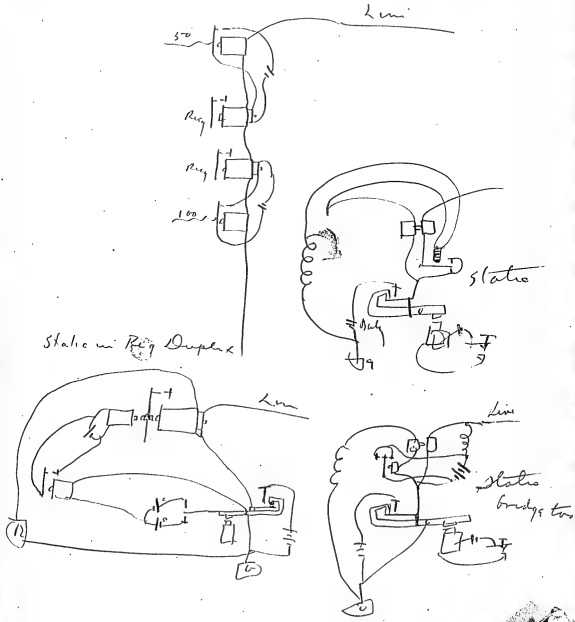

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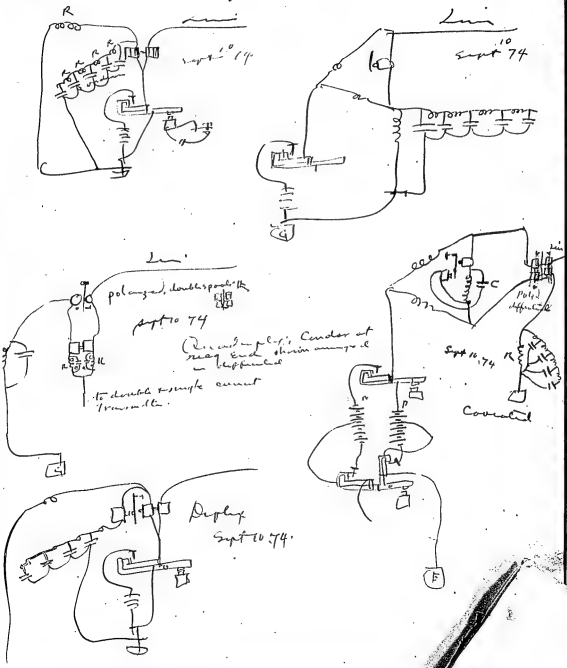
Entered Sept 10, 74

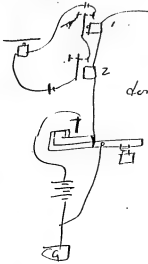
Circuit arrangement for station



58

Sept 10. '74.

~~[illegible]~~ Display: check w/ multi differential or bridge



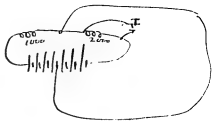
~~[illegible]~~

don't look as if stumped

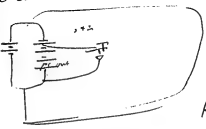
Problems:

Reversing multi angle Galvy

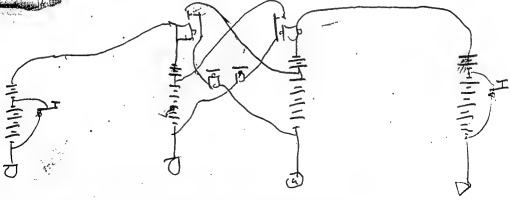
Moseley



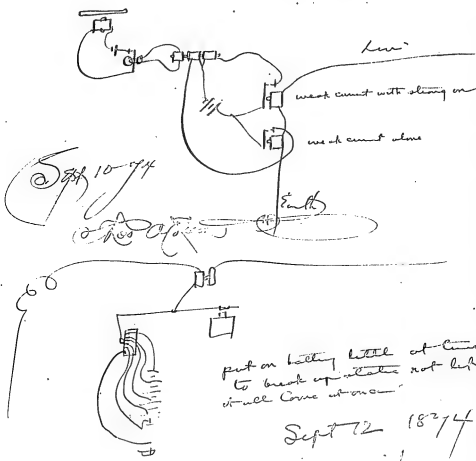
also.

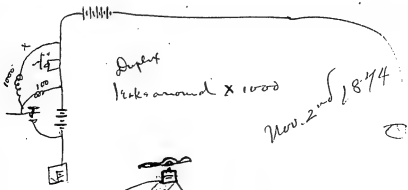


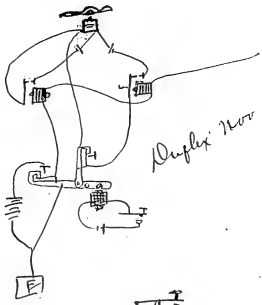
Repeater

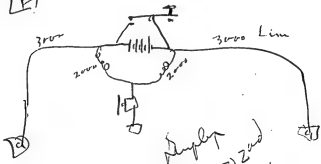


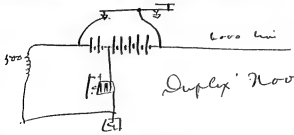
Transmission with same direction



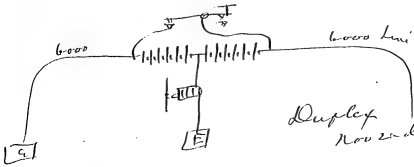

Duplex
Resistance x 1000
Nov. 2nd 1874
1000
100
E


Duplex Nov 2nd 1874
E

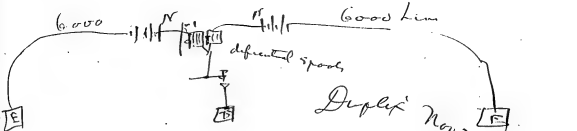

3000
3000 Line
2000
2000
Duplex
Nov 2nd
1874



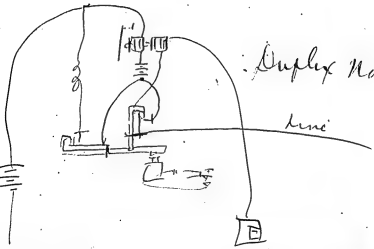
Duplex Nov 2nd 1874.



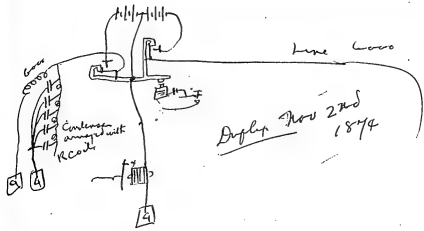
Duplex
Nov 2nd 1874.

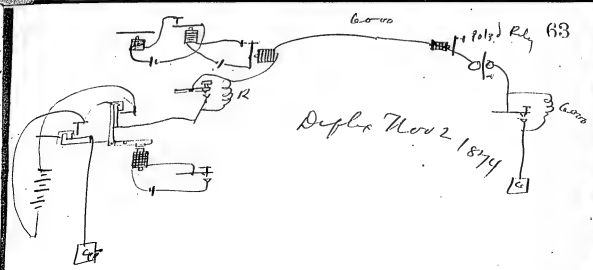


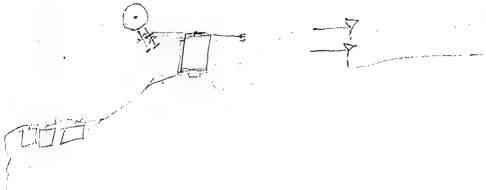
Duplex Nov 22nd 1874



Duplex Nov 2nd 1874

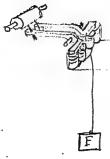

Line Loop
Gas
Contents amount unit
R Cont
Duplex Nov 2nd 1874

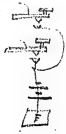

Polyd Rly
R
Duplex Nov 2 1874



Michelson

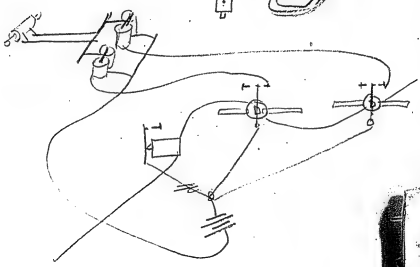
Exhibited about that time





Sept 1870

Come to Gilliland about this time to have
1. made active per resistance like this
2. [illegible]
to [illegible] upon [illegible] [illegible] each
in 1 wire —



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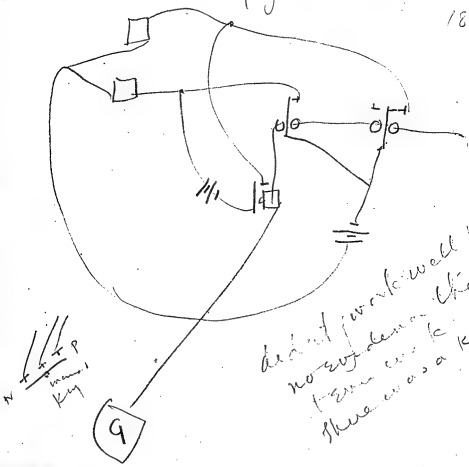
This is the idea given to by Gilliland from near 1870



dated from well to no wooden or chalk term work there was a kick

Commencing the duplex idea, he detailed explanation of 1873.

Laboratory Scrapbook, Cat. 299

This scrapbook contains only a few dated entries, covering the period May-October 1873. Most of the laboratory notes and drawings are by Edison; some are by Charles Batchelor. They concern telegraphy, particularly chemical and printing, and contain many examples of both printed and chemically treated tape. There are also unused printed forms from several telegraph companies, as well as four pieces of correspondence (one by Edison), a brochure from the Electric Railway Signal Co., a circular from the Galvano-Faradic Manufacturing Co., and a clipping on peripolar induction. The cover is marked "Y." The book contains 306 numbered pages.

Blank pages not filmed: 2, 4, 6, 8, 48-49, 55, 76-78, 80-82, 84-306.

with Ferricyanide Solution — oz Ferricyanide, lb of Salt (Chl Sodium) gal water, attempts to increase delicacy by the addition of following.

Muriate ammonia – small quantity.

Sulphit Calcium.

Stearic acid

Hydrofluoric acid

Cyanuric acid

Nitro prusside Sodium

Sptr Coniepthar

Sul Acid & Ferric Chlorid

Sul Pot

Carb Potassium

Hyp Ammonia

Sul Soda

Bi Chloride Mercury

Nit Cobalt

Hyposulph Soda

Sulph Zinc

Bichromate Soda

Ferrocyanide K

Hydrosulf acid

Gallic acid

Acetate Lead

Ch Pot

Sul. Copper

Oxalic Acid

Borax

Citric Acid

Chromic A

Potassio Sulphocyanide

Chloride of Iron

Sul. Soda

Acetate of Manganese

Oxalic Acid

Alum

Silicic Acid

Acid

Ferrocy Pot

Mang

Metallic Zinc

Iodis

Tartaric Acid

Sal Ammon

Mur. Cobalt

Salt Peppetter Nitric

Silicate Soda

Formic Acid

Iodine

Not a pure a Fluoride

Iodine

Nitrate Silver

Bichom Pot

Above Text page 77 to 87

1

Ferrocyanide Solution

Chl. Lime — signs marks light yellow. soon bleaches
Citrate Magnesia. marks inferior blue.
Carbonate Pot. faint yellow marks inferior
Phosphate Soda blue " after a time quite strong very comes out very faintly
Carbonate Pot & ferrid in excess yellow marks
Aqua Ammo drab marks inferior very
Boracic Acid Blue — good slightly inferior ×
Silicic Acid " " inferior dark drab color
Sulphate Pot " " " slightly
Arsenic Ac " " " very.
Carb. Soda light blue " " "
Sulphate Copper " " slightly
Sulph Zinc " " "
Nitric Acid " " very
Formic Acid " " slightly
~~Tannic Ac further exper good~~ ×
Acetate of Lead inferior
Alum " " "
Cyanide Pot yellow " " very
Carb Ammonia drab-light " very
Stearic Acid Insoluble
Hyposulphite Soda same as original
~~Muriatic Acid~~ ~~contains~~ ~~marks~~ ~~slightly better~~ ×
Phosphate Lime no marks
Tartaric Ac. no change.
Sulphuret Calcium blue marks inferior very
Iodide Pot. blue inferior

2

Nitrate of Zinc is not good without salt.
Benzoic Acid blue mark, inferior very.
Oxalic " " " " very
Acetate Manganese " " " "
Ferrocyanide Pot " " "
Nitroprusside Sodium " " " "
Spirits Camphor " " " slightly
Chromic Acid " " " very
Nitric & Pyrogallic Ac " " " very
Hydrofluoric Ac. " " "
Sulphur flowers would mix at all
Oxalic Acid blue mark inferior slightly
Chloric Acid " " " "
Prussian Sulphocyanide " " " "
Nitrate Cobalt "lighter" " very
Silicate Soda "blacker" " slightly
Bichromate Pot Ragged dark blue mark " "
Ammonia Sul of Iron green mark " "
Bichloride Mercury " " " slightly
Bi chromate Pot & Sulph Acid best when first come out fades to light green inferior.
Ferrid cyanide excess "
Starch excess best yet so far.
Sulphuric Acid better than regular darker mark
Nitrate silver deeper mark than regular
Black Ox Manganese light green inferior
Sulph Acid & Ferridcyanide of Pot alone " very
Peroxide of Iron good deeper than regular but ragged mark.

3

Gallic Acid Blue mark Superior slightly
Hydrosulphur A. inferior

①

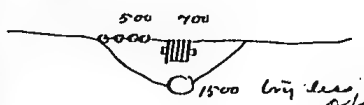
Make three large Secondaries with Calland jars and pure water to get a shorter after charge. End

Roughen the surface of the electrodes to allow of the escape of the gases more quickly so as to give a shorter after charge.

Try 6 plates copper 1 inch wide 4 long with two thicknesses paper in between moistened with pure water first & salted if unsatisfactory End

Test with line of relays alone then shunted with Secondaries

The shunt should be placed thus -



try less - to be practical must be much less
OK. No stick & little end on line

Try both ways the relay should not stick this way.

②

Try secondaries well salted with the ends of electrodes barely touching the water see if the gas does not escape quicker and thus send a ~~longer primary~~ shorter after current.

Also use wires of Gutta percha in well salted water and bare then two inches at end & coil sink to bottom of bottle. The theory being that owing to the increased pressure the gas will be forced up owing to light specifgrav

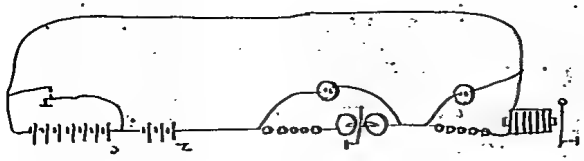
The light with charge is probably due to the after charge sticking in the battery

make a secondary thus

desk cop. then flannel. then Paf p: then Cop

to desk

Rouge cannot strongly back point displex
Relay and polarized armat on chorus
see if better result obtainable

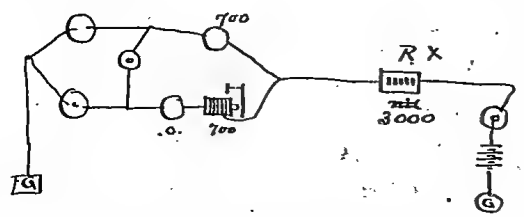


Salt well with acetic acid and
Connect internally to a fine rotary or mag
Paper thin Cake & cup bottom with like
Lice Ends in hand and connect to

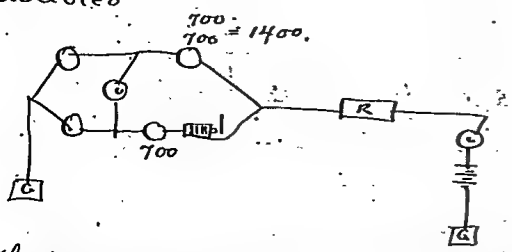
successive portion of battery for an instant say 6 at time. if the sections are charged quickly there will probably be a Continuous Current from Condenser battery. If so see which is strongest the original 6 or the 30. secondaries. it may be that a revolving Contact maker might be applied to a large number of secondaries using a small charging battery and a Continuous Current obtained having the same tension as the number of secondary ie if there were 100 secondaries and 6 regular cups the tension would be that of 100 cups but the total quantity would be only equal to 6 cells weakened of course by internal R of secondaries

Shunt a relay of "X" R. with one same R put in bridge, I'm not sure that the induction due from both will go on line one may kill the other. No makes just same dont increase by the battery as I thought

Test to ascertain if the discharge from a magnet is lengthened by an increase in the resistance of the circuit in which it discharges. Thus.



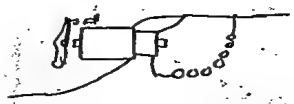
Increase the length or R of the discharging circuit but insert a gal in main so that by reducing the R of RX. the same strength of current is had but the discharging circuit is doubled



The latter ought to give a weaker but longer discharge if not then the discharging time

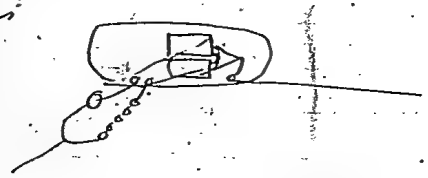
find out what that clicking thump is on opening ckt. on wet paper =

Try this

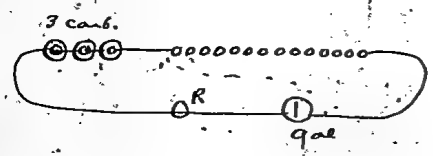


See if stops induction - if so see if relay stiff. ~~then reverse cart~~

Try this



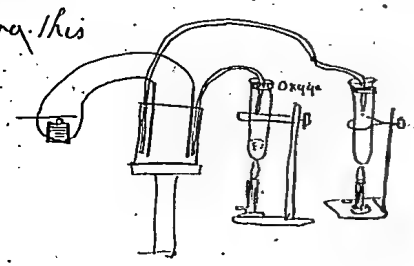
Try this



Then with cab alone inserting R to keep same. No good

②

Try this

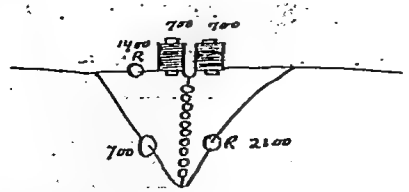


Two platina electrodes, water heavily acidulated with sal acid, pass a stream of oxygen and hydrogen down by electrodes see if generates current. Try. Black Ox Mang. Chl. Pot. Oxygn Zinc & Sul a. Hydrogn try common gas. If dont work try adjust volume gas so there be 1. H 1 B.O. dont work then ~~use iron~~ replace one platina with iron. Try oxygn alone & Hy alone Then try Zinc with H & Platina with Ox. no acid, of if acid get regular Current deflection & see if gases add to

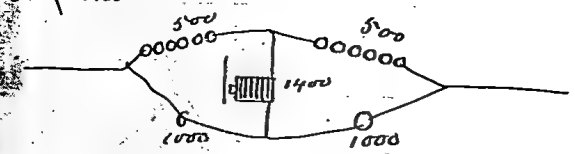
Not

①

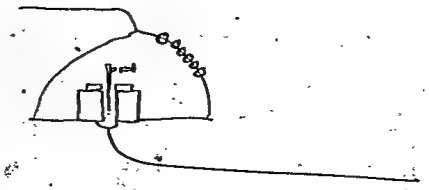
Try this first on ofs line to see if it kills induction, second to see if relay dont stick or second closing



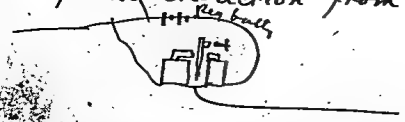
Try this



Try this

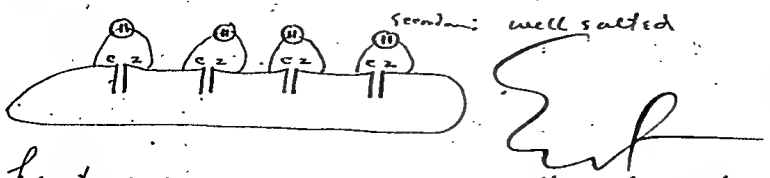


See if any induction from this



Let 6 cups of Carb completely run down
Try if this dont give heavy with and hardly any after =
A played out Car battery when first closed along then weakens to nothing

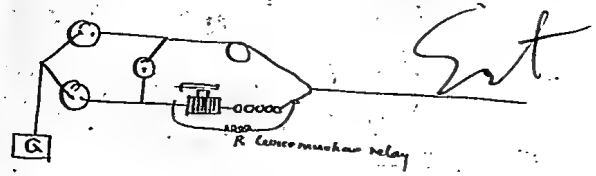
Try this 6 cups carb



Heat iron receiving pen with glass tube having fine end attached to rubber tube & gas - see if delicacy increased.

Dunchenel 732.
Tin foil strip, paper over it, salt.
hydrogen reduces the oxide of tin which is always on tin and if the foil be now treated with a mixture nitric & pyrogallic acid. They come out black - the may insulate & do repeatly

Try this. The placing of the secondary battery in the direct circuit instead of shunt alters its action as regards relay but not as regards Cms & by placing it this way all bad effects on relay may disappear.



Get

Alcohol.

3 Eggs for albumen

Charcoal

White Sugar

Onions

Red beets

Red Cabbage make solution

Syrup of Violets

Petals of red roses

Rhubarb.

Brazil Wood. } test papers.

Georgina

Silver wire for pens

Magnesium

Palladium.

Copper

Zinc

Antimony got it

Aluminium

Bismuth got it

Iridium

Lead

① Large Lump Manganese

plumbago pen

nickel pen

Tin "

Brass "

German Silver.

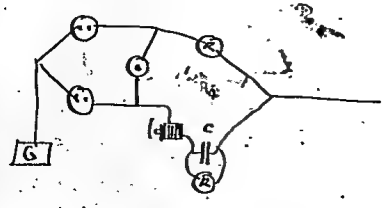
Platina drum

Try Tumeric & sulphate soda

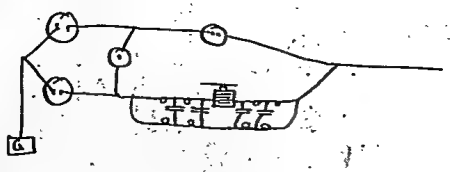
of an electro magnet is independant of exterior R. but it ought to be weaker, if not then tension must be very high =

Try sheet lead for secondaries. also sheet iron - tin,

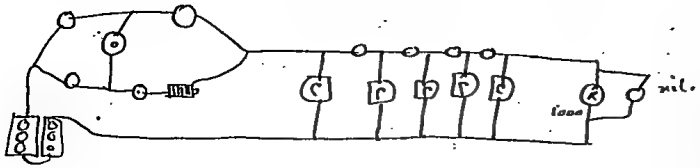
Try this



Try this



Kill the discharge.



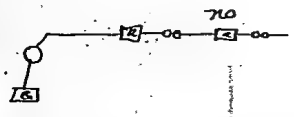
when line caut be worked at 100 w no how with shunt + small magnet. + battery at sending end connect as above + try get it. it will be very weak but probably be good working.

Make a double ~~Foot~~ pen holder

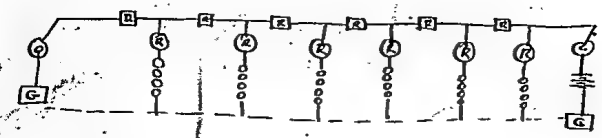
- Try a line statically fixed in Bridge in place of magnet to steady it

Try amount of discharge from 6 bottles with water alone and with various quantities salt, keeping the strength of main constant by def gal & R coil.

Try this

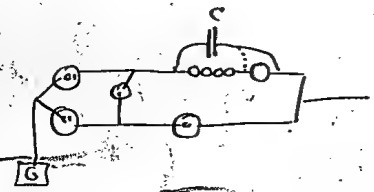


End

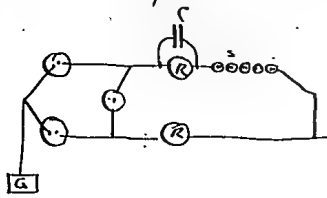


See if this don't imitate the cable charge

Try this

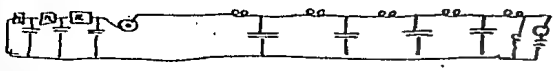


Try this to lengthen the discharge.

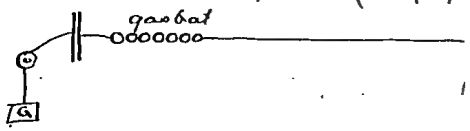


End

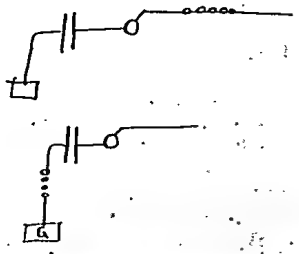
Try this no. next



Lengthening by gas & condr discharge



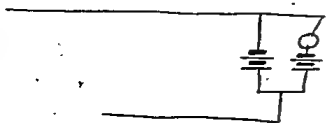
also



with no static in first circuit, notice the induction & how it makes the dashes look. use enough battery if possible to record on perm.

Try with line well fixed statically with magnet shunt if doubling the quantity will show any change thus

Ent



Try iodide solution, small quantity at rate of 1 lb to gal & saturate completely rest water with salt, then try at rate 2 1/2 lb to gal & saturate with salt. then try wet both without salt or rather try that first - use flow each case, Lay some regular Iodide paper out to dry for use in Experimenting

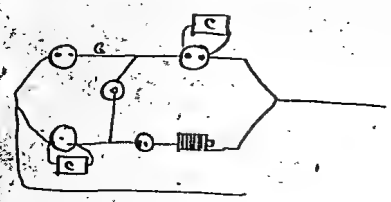
arrange 30 pieces tin foil thus. first dry paper paraffined. then sheet foil. the sheet paper wet with solution salt. then foil then connect these two together. then wet sheet then foil then sheet then foil connect these together. then shunt receiving unit with it. also insert in main with no static see ~~if no static~~ if counter change both sides paper ~~wate~~ watch.

Ent

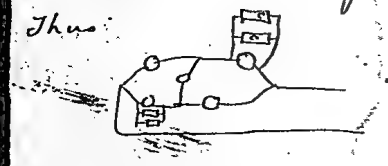
The effects on duplex relay by closing second coil adding condr etc can be studied in bridge

Try receiving with a battery at receiving end. make line with great amount static, and arrange thus

next p

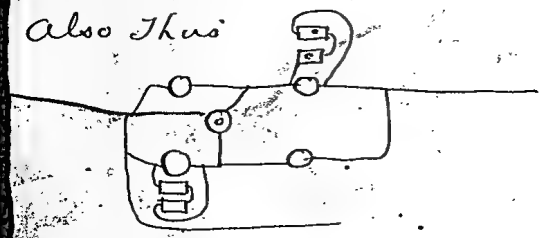


insert magnet at 9 as former Expmt O.K.
notice particularly the extra amount of induction given by the condenser
Then disconnect magnets and insert plain and study the action of the Condensers
& add to them quantilized say 2 condens
Thus:

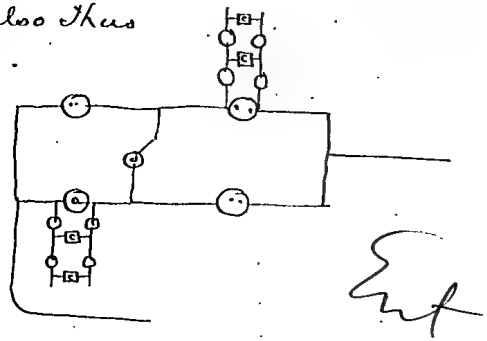


Ent

Also Thus

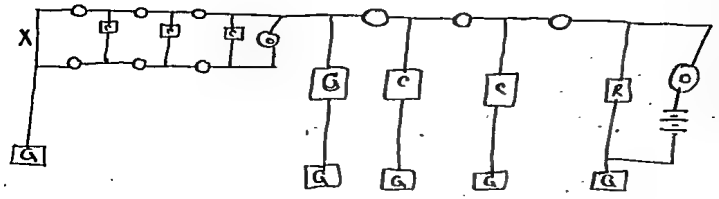


also Thus



Ent

also Try this the expectation being that the receiver of the first circuit being at the transmitting end of the second circuit. that there will be a back charge

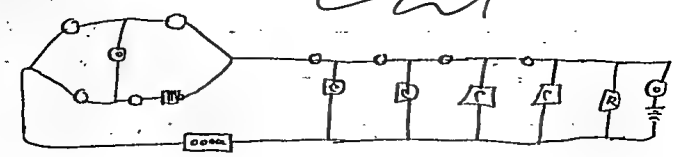


② ① Try it with circuit broken at X. the second circuit may have to have high resistance to get a back charge. see what effect will be

allow for the ~~ballance~~ R of the relay or magnet.

By this arrangement it is possible to determine the amount of discharge from any particular arrangement of magnets. As resistance being balanced by the Rheo X. if it works well use it for determining the discharges

also try on this arrangement if 12 cup on permanently acting with quite any more or less induction also acting against arrange this

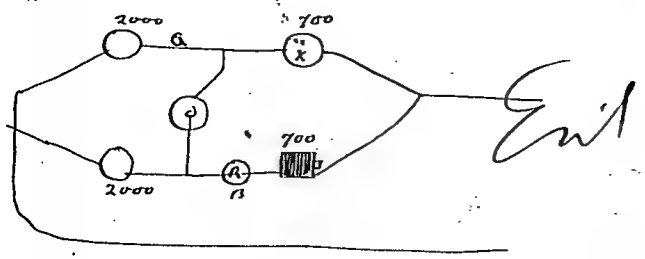


②

Try the effects of the addition of a Condenser to the branches containing the placin R Coils Thus

Over

Try this. getting the inductive effect free from the main current and regulating the latter so that just enough may be used to make the dashes

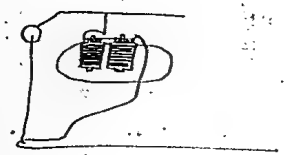


①

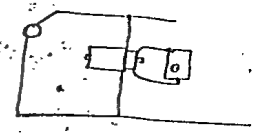
all being equal no main current flows through the paper but the inductive action upon the opening & closing of the main is generated within the first V and is recorded upon the paper If now the R.B. is inserted with a slight R. then the balance for the main current is destroyed and an amount of main current proportionate to the resistance unplugged in B. passes through the paper It is probable that a magnet may be inserted at G. and the R. coil reduced so as to

local current and leaves an excess. The theory being that a reversal of the polarity of the iron core generates more induction than without - Try both with and without second circuit. Try without battery. by just closing coil, Thus

1

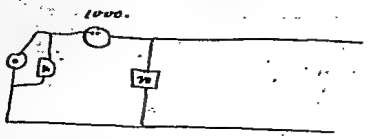


2



add condenser to it thus 2 notice effect.

Try a double compensator, Thus



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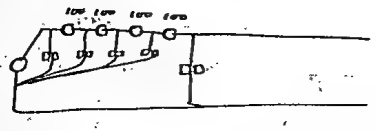
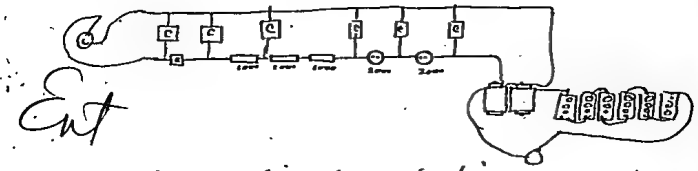
Also



②



Ent

Duplex relay work over line by induction currents, arrange in first place with battery direct with 300. ohm shunt. and small relay in. with best magnet shunt at receiving end and increase resistance so that it is impossible to get 100 words then replace shunt by double coil relay and work with inductive currents, see if 100 can be got with inductive currents.

Get 10 rolls perm with Boston paper for records,

①

arrange as above if induction dont work and replace shunt and use Duplex relay as receiving shunt. one coil only. then arrange a box of battery with one of the round Bradley R boxes with second coil & unplug R till the main line current neutralizes the

Try. Ferrocyanide & nitrate Ammon. & after
Decq. dip in Sol Nitric A & Pyrogallic A

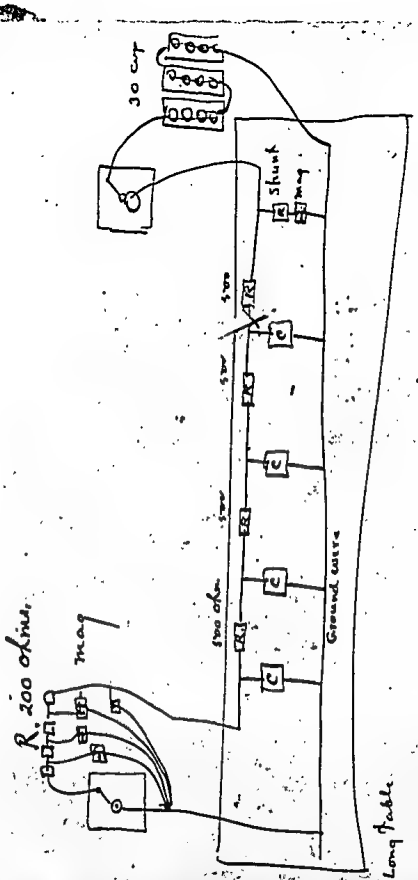
Treat that tin foil with Solution Salt
— go for those Marks on the tins to wk
Em moulate —

①

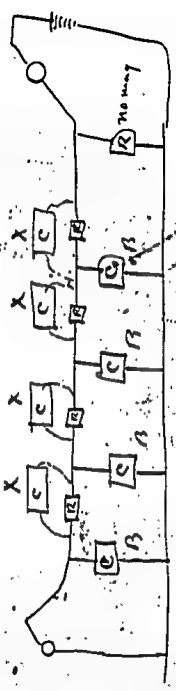
Try two large Secondary batteries, Callaud
Jars, & two small both same R. made
so by less Salt in. large.

②

Try homogeneous magnetic experiments
Rec.



Try this & ascertain if the X Condensers can kill
the B Condensers. The X Condensers may have to
be three times as strong as the B Condensers,



Experiment on Boxes, 1 fine wire mag &
plural equally much given. Connected for
quantity & be same R as which best
can

③

Acetate Lead C Pure. 1/2 lb.
Ammonia Water Conc 1/2 Gallon bottle Pure
Potash antimoniate pure. 2 oz
Bicarbonate Soda. 1 lb.
Bichloride Mercury CP. 4 oz
Bichloride of Platinum in solution 1 Ounce
Bisulphate Potash Pure. 3 oz
Bone Ash. 1 lb
Boracic acid see if got it.
Borax. powdered. 1/2 lb.
Carbonate Ammonia Pure. 1 lb.
Chloride Soda Pure 1 lb. Cryst Pure.
" of Ammonium Pure 1 lb
" Barium Pure Cryst ~~2 oz~~
" Calcium Pure Cryst dried 3 oz
Chloride of Lime Pure. 1 lb
Chlorin Water 1. lb
Cyanide of Pot
~~Chloride of Potassium~~ pure
Cyanide Pot Pure. 3 oz
Ether Pure 1/2 lb
Ferricyanide Pot. see if got it
Ferrocyanide Pot
Hydrofluoracic Acid see if got it 1 oz

Oxygen when set free in a solution of pyrogallic acid &
potash (Try Carb & Caustic) turns dark brown color.
Platina pen—also iron =
Lead pen.- Acetate Lead, Sugar Salt, Hydrosulpt Am
Proloxide. 1 of ox. peroxide highest amount of oxygen
Protoxide called ferrous oxide, Sesquioxide called ferric oxide
Make a pen tipped with metallic manganese.
The result will be a proloxide of manganese find
test for this and wet paper with it, using salt or
other alkaline Sol for conductivity
Nickel pen — forms proloxide — get test for protoxide
& wet paper in it
~~Wet a roll of Hydrosulphuret Ammon Yellow paper~~
and a roll of Logwood Sulphate iron paper
& take to nyork test — go to Terrells, Munns,
Van Nostrands See Watts Dic Chem & any book
Containing great number of tests, Miller.
Take iron pens over, put up gallon pkgs. for
Shipment. If Hydrosulpht & Galls test good, patent
ox it = get some of Sulphocyanide of Potassium.
Aurochloride of Sodium
Copper pen. proloxide Cupric — get test for
get some proloxide iron — go to Luhme get specs for

Over

for pens. Aluminum 40c dr 1 dr
Boron. #1. spec 1. Cadmium. 75c oz 1 oz
Chromium. #1 - spec 1. Iridium #1. spec 1.
Iron reduced by Hydrogen. 30c oz 1 oz
Magnesium. 60c dr 1 dr. Manganese pure lump
Conducting mang. Manganesium. 50c spec 1
Molybdanum 50c spec 1. Nickel 20. oz oz
Osmium. #1 spec 1 Palladium foil. 20c gr 5 gr
Palasium. 75c dr 2 dr Rhodium #1 spec 1
Selenium 1.50 dr 1 dr Silicon. 50c spec 1
Silver foil 200 oz ½ oz Sodium. 35c dr 3 dr
Thallium. 50c spec 1 Tellurium 100. spec 1
Titanium #1. spec 1 Tungsten. 50c spec 1
Uranium #1 spec 1.

#20

Hydrosulphate Ammonia 2 oz
Hydrosulphuric Acid 1 lb C of g bot
Iodine ~~get that~~ 1 oz get it at Chem
Lime water 1 quart
Litmus Paper 1 qr.
Molybdate Ammonia pure 1 oz.
Nitrate Baryta. pure Cryst. 4 oz
Nitrat Cobalt. Pur Cryst 1 oz
Nitrat Potash pure Cryst 1/2 lb.
Nitro-Prusside. Sodium Pure. 1 dr
Phosphate Soda Pure. 3 oz
~~Microcosm~~ Microcosmic Salt. Pure. 1 oz
Oxalate Ammonia pure Cryst. 3 oz.
Perchloride of Iron Pure Cryst. 3 oz c. of bo t
~~Potct~~ Caustic Pot. Chem Pur 2 oz.
Protochloride of tin pure 4 oz
Sulphate Copper Chem Pure 5 pound
Sul Lime Pure percip 2 oz
Sul Magnesia pure 1/2 lb
Sul Acid Pure. 1/2 gal bot
Tartaric Acid pur Cry 4 oz

Protochloride of Tin pure 4 oz
Sulphate of Copper Chem Pure 5 pounds.
Sulphate of Lime percip 2 oz
" " Magnesia pure ½ pound
Sulphuric Acid pure. ½ gallon bottle.
Tartaric Acid pure crystl. 4 oz.

Yours.

Thos A. Edison

Dot & Dash System

Large perforator.
Three Key perforator recent
Transmitter. Belt now used roller pens
Iodine paper, more than 1 lb to gal water with or without a starch compound.
Ferricyanide, red prussiate of potash & alkaline salt solution.
Nut galls & Hydro Sulphuret of Ammonia & alkaline solution
Alkaline & Logwood solution,
Sulphuret of potash & alkaline solution
All the circuits upon the magnetic principle – Combination with Morse Quantity Battery
All the circuits upon the condenser principle. Shunted Relays, magnetic leaks, Secondary batteries do Condenser shunted do Recy with Secondary Secondary along line Roman letter principle

The paper.
The perforator.
The 5 wire machine ~~or~~ with five roller pens. - Brief description of 1 wire machine, Mention that the letters may be ~~Embossed~~ — ~~Opals~~.

Carbonate of Ammonia pure. 1 pound.
Carbonate of Soda pure. 1 pound.
Chloride of Ammonium pure 1 pound
" " Barium pure cryst 2 oz.
" " Calcium " " dried 3 oz
Chloride of Lime pure. 1 pound
Chlorine Water 1 pound.
Cyanide of Potassium pure. 3. oz.
Ether pure. ½ pound
Hydrosulphate of Ammonia. 2. oz.
Iodine. 1. oz.
Lime Water 1. quart
Litmus Paper 1. qr
Molybdate of Ammonia pure. 1. oz.
Nitrate of Baryta. pure cryst. 4 oz
Nitrate of Cobalt. " " 1 oz
Nitrate of Potash " " ½ pound
Nitro-prusside of Sodium. pure 1. dr
Phosphate of Soda pure 3 oz
Microcosmic Salt. pure. 1 oz.
Oxalate of Ammonia pure cryst. 3 oz
Perchloride of Iron " " 3 oz
Caustic Potash pure 2 oz

Dot & Dash System

Large perforator.
Three Key perforator recent
Transmitter. Belt now used roller pens
Iodine paper, more than 1 lb to gal water with or without a starch compound.
Ferricyanide, red prussiate of potash & alkaline salt solution.
Nut Galls & Hydro Sulphuret of Ammonia & alkaline Solution
Alkaline & Logwood solution.
Sulphuret of potash & alkaline Solution
All the circuits upon the magnetic principle – Combination with Morse Quantity Battery
All the circuits upon the condenser principle. Shunted Relays, Secondary batteries do Condenser shunted do
Recg with Secondary
Secondary along line Roman Letter Principle

The paper.
The perforator.
The 5 wire machine ~~dr~~ with five roller pens, - Brief description of 1 wire machine, mention that the letters may be Embossed — Circle.

Messrs R & G. Newark Sept 3. 1873.

I see you do not fill list very complete, please keep missing articles on order book and when you get enough to fill a small box, ship to Thomas A. Edison 10 & 12 Ward St Newark N Jersey. where please address any letters, send box C.O.D.

Please send following order to me C.O.D.

Acetate of Lead. pure. ½ pound.
Ammonia Water Conc 1 ½ gallon bottle
Antimoniate of potash. pure. 2. oz.
Bicarbonate of Soda. 1. pound.
Bichloride of Mercury. C.P. 4. oz.
Bichloride of Platinum in solution 1. oz.
Bisulphate of Potash. pure. 3. oz.
Bone Ash 1 pound.
Borax powdered ½ pound

(4)

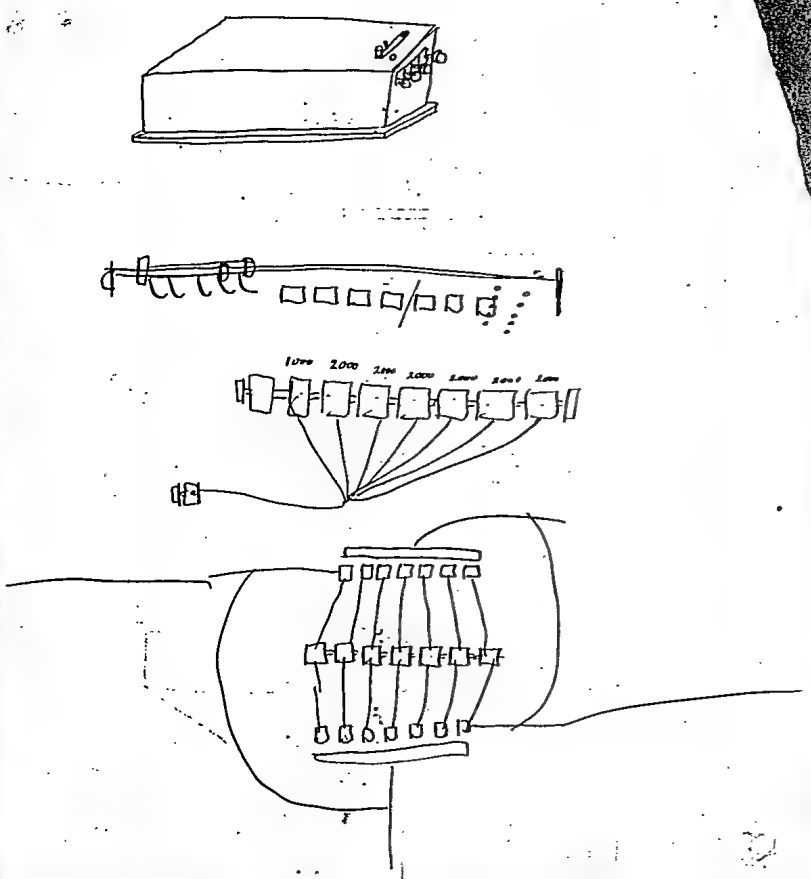
Dot & Dash System

Large perforator.
Three Key perforator recent
Transmitter. Belt now used roller pens
Iodine paper, more than 1 lb to gal water with or without a starch compound.
Ferricyanide, red prussiate of potash & alkaline salt solution.
Nut Galls & Hydro Sulphuret of Ammonia & alkaline Solution
Alkaline & Logwood solution.
Sulphuret of potash & alkaline Solution
All the circuits upon the magnetic principle – Combination with Morse quantity Batty
All the circuits upon the condenser principle. Shunted Relays. Magnetic leaks. Secondary batteries do Condenser shunted do Reg with Second Secondary along line Roman Letter principle

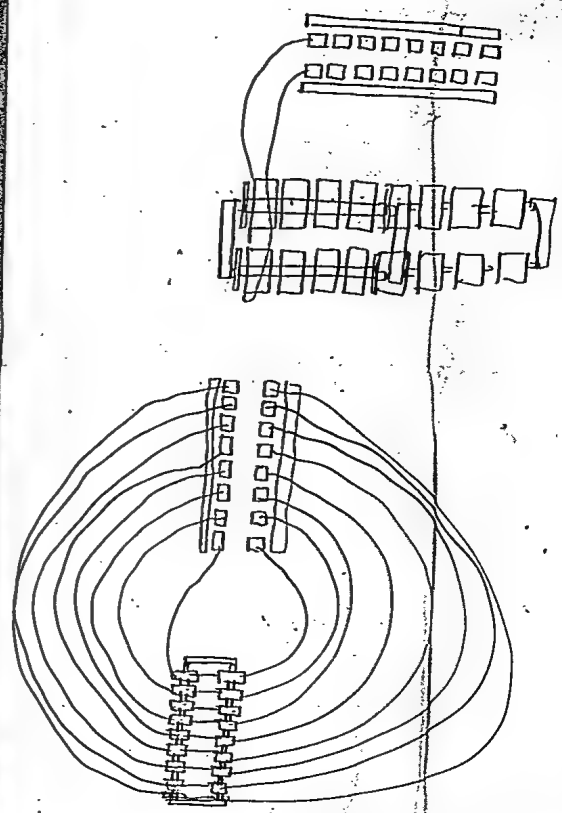
The paper.
The perforator.
The 5 wire machine ~~dr~~ with five roller pens. Brief description of 1 wire machine, mention that the letters may be Embossed — Wesle.

(5)

①



②



2000 ohms each

THE ONLY

RELIABLE AND EFFECTUAL METHOD

AND MOST SUBSTANTIAL MACHINE

FOR THE

Prevention of Alteration of all Monetary Documents,

PATENTED MAY 6, 1873.

Philadelphia, Sept 30 1873

Mr. Thos. A. Edison,
Newark N.J.

Dear Sir:

I have today sent you a copy of my recently obtained Letters Patent which I hope will duly come to hand. It is my desire to sell the same in State Rights. Now to make it a quick sale I will sell you the State Rights for New Jersey, for Eight Hundred Dollars or its equivalent. Please give the matter your attention & you will find it of great value & need throughout the Country. Please let me hear from you soon, & oblige,

Your Very Respectfully

L. Pfeifer

Post Office Telegraphs.—No. 69 c.

G [229] 200,000 1|73

Service Message Form.

POST OFFICE TELEGRAPHS.

Free Message on Official Business.

Prefix DS

Office 26-5-3 187

Office from	Time recd.	CLERK	Office to	Time sent	CLERK
		Havard			

From DS HARSON TO LUNSDEN TS

XECT MR WRIGHT WILL BE ABOUT HALF HOUR BEFORE HE IS READY WITH THE BATTERY

Signature of Sender

This Form is to be used for Engineering Messages only.

ONE HUNDRED AND FIFTY WORDS PER MINUTE WITH PERMANENT PAPER AND TWO HUNDRED AND FIFTY WITH FUGITIVE WHEN FIVE CIRCUITS ARE USED THE SPEED WILL EXCEED 1000 WORDS PER MINUTE ONE MAY LOOK TO FLASH BRIGHT

THIS IS A SPECIMEN OF EDISONS AUTOMATIC TYPE TELEGRAPH

DESCRIPTION OF
PRINTING
TELEGRAPHS

Stalbrand

Try this.

Insert ~~between~~ as shown the round rheostat.

Try tomorrow if the Box can be left on first button & receive from W & regulate by Rheo. to lengthen the side of shunt in which receiving instrument is,

Have Sewell prepare caveat saying that instead punching Roman may be embossed by same machine & the bosses used to lift levers & close circuit

Blank No. 4

NIGHT MESSAGE BLANKS.

THE SOUTHERN AND ATLANTIC TELEGRAPH COMPANY

AT ONE HALF THE REGULAR RATES,

[illegible]

CHIEF OFFICE: No. 4 NEW STREET, P. O. Box 3098, NEW YORK.

Send the foregoing Message, addressed to the above office, to be transmitted, which we agree to do

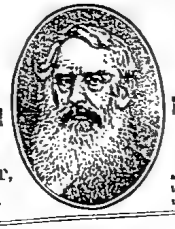
187

To

190

Blank No. 1.

THE SOUTHERN AND ATLANTIC TELEGRAPH CO.



REDUCED RATES!

PROMPT DESPATCH!

CHIEF OFFICE,

51 NEW STREET,

P. O. Box 3098, NEW-YORK.

CONNECTING

WITH ALL

POINTS NORTH, EAST & WEST,

And with EUROPE by Cable.

All messages received for transmission are required by the Company's Rules, to be written on its message blanks, subject to the conditions printed thereon.

Comes & Co., 33 Pine St., N. Y.

187

Received from

Addressed to

1.70

1.30

Immediate - 1.00

Blank No.—See Rule LXX.

Daily WEEKLY STATEMENT

Office.

Southern & Atlantic Telegraph Company.

For week ending night of 187

Total No. Messages sent from this office, paid here

" " rec'd at " collected here

" " sent from " to collect

" " " " D. H.

GROSS RECEIPTS IN CASH SINCE LAST REPORT.

This Line

Other Lines

Commercial Quotations

Press Specials

I certify this Report to be correct.

No. 45.

HALF RATE MESSAGES.

The Western Union Telegraph Company *will receive messages for all stations in the United States East of the Mississippi River, to be sent during the night at ONE HALF THE USUAL RATES, on condition that the Company shall not be liable for errors or delay in the transmission or delivery, or for non-delivery of such messages, from whatever cause occurring, and shall only be bound in such case to return the amount paid by the sender.*

No claim for refunding will be allowed, unless presented in writing within twenty days.

O. H. PALMER, Secretary. WILLIAM ORTON, President.

Send the following Message subject to the above terms, which are agreed to.

187

Blank No. 3. NIGHT MESSAGE

THE SOUTHERN AND ATLANTIC TELEGRAPH CO.

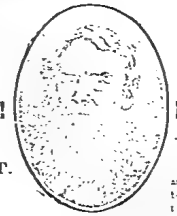
REDUCED RATES!

PROMPT DESPATCH!

CHIEF OFFICE,

51 NEW STREET.

P. O. Box 3094, NEW-YORK



CONNECTING WITH ALL POINTS NORTH, EAST & WEST, And with EUROPE by Cable.

All messages received for transmission, are subject to the Company's Rules and Regulations, copies of which may be obtained at the Company's Offices.

[illegible] 187

Received from

Addressed to

190

THE WESTERN UNION TELEGRAPH COMPANY.

The rules of this Company require that all messages received for transmission, shall be written on the message blanks of the Company, and are subject to the conditions printed thereon, which conditions have been agreed to by the sender of the following message.

THOS. T. ECKERT, Gen'l Sup't, NEW YORK. | WILLIAM ORTON, Pres't, C. H. PALMER, Sec'y, } NEW YORK.

Dated _____ 187

Received at _____

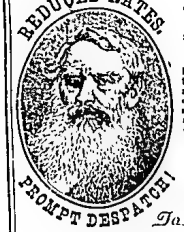
To _____

☞ THIS TELEGRAM HAS JUST BEEN RECEIVED AT THE OFFICE IN

WHERE ANY REPLY SHOULD BE SENT.

Direct Wires.

Blank No. 9.



THE SOUTHERN AND ATLANTIC TELEGRAPH CO.

Connecting with ALL POINTS NORTH, EAST and WEST, and with EUROPE, by Cab

All Messages Sent by this Company are Subject to the following Conditions:

To avoid errors, those sending messages should order them repeated, or telegraphed back from the place to which For this, an additional charge of one half the regular rate will be charged. This Company's liability for mistakes or delays in transmitting or delivering messages, or for their non-delivery, is expressly limited to the sum received by it for sending a non repeated message, and to fifty times the sum received for sending repeated messages. It will not be responsible for cipher or obscure messages, nor for delays caused by unavoidable interruptions in working its lines. All claims for damages must be presented in writing within sixty days after sending the messages on which such claims are based, otherwise they will not be allowed. In forwarding messages on any other lines than its own, to reach their destination, this Company acts simply as agent of the sender, assuming no liability.

CHIEF OFFICE, 51 NEW STREET, P. O. BOX 3098, NEW YORK.

..... 187

To .....

Address (in full) .....

..... 170

..... 130

..... 100 ft

Please write your Address under Signature.

Cobb & Co., 21 Park Pl., N. Y.

Blank No. 7.

DATE.	CHARGES THIS OFFICE.		No. Messages.	THIS OFFICE CHARGES.		No. Messages.	DATE.	CHARGES THIS OFFICE.		No. Messages.	THIS OFFICE CHARGES.		No. Messages.	DATE.	CHARGES THIS OFFICE.		No. Messages.	THIS OFFICE CHARGES.		No. Messages.	DATE.	CHARGES THIS OFFICE.		No. Messages.	THIS OFFICE CHARGES.		No. Messages.	DATE.	CHARGES THIS OFFICE.		No. Messages.	THIS OFFICE CHARGES.		No. Messages.
	For This Line.	For Oth. Lines.		For This Line.	For Oth. Lines.			For This Line.	For Oth. Lines.		For This Line.	For Oth. Lines.			For This Line.	For Oth. Lines.		For This Line.	For Oth. Lines.			For This Line.	For Oth. Lines.		For This Line.	For Oth. Lines.			For This Line.	For Oth. Lines.		For This Line.	For Oth. Lines.	
1							1							1							1							1						
2							2							2							2							2						
3							3							3							3							3						
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29							29							29							29							29						
30							30							30							30							30						
31							31							31							31							31						

The Western Union Telegraph Company,

187

NAMES OFFICES.	ADDRESS.	To What Place.	SIGNATURE.	From What Place.	No. of Words.	Local Cash.	Other Offices Check.		This Office Checks.		Other Lines.	
							This Line.	Other Lines.	This Line.	Other Lines.	Dr.	Cr.

CABLE REPORTS,

SOUTHERN AND ATLANTIC TELEGRAPH COMPANY.

No. of Message	TO WHOM ADDRESSED.	TO WHAT PLACE	SIGNATURE.	FROM WHAT PLACE	No. of Words.	TOTAL CASH RECEIVED.	NAME OF OFFICE. Checked in Account with	CHECKS THIS OFFICE. This Line.	CHECKS THIS OFFICE. Other Lines.	THIS OFFICE CHECKS. This Line.	THIS OFFICE CHECKS. Other Lines

BLANK No. 11.

CHECK REPORT *of Free Message Account of the*.....*Office,*

for the Month of.....187

All Free Messages Sent or Received, except those mentioned, must be accounted for below. Check and credit Free Messages as this blank directs, in the same manner as Commercial Messages.

Write below, in alphabetical order, names of offices with which you have Free Messages account during the month. Give the name of the State with each office, and if there is more than one office of the same name in a State, specify the County	CHECKS THIS OFFICE. Messages Sent.		THIS OFFICE CHECKS. Messages Received.	
	No. of Messages.	Amount.	No. of Messages.	Amount.

Write below, in alphabetical order, names of offices with which you have Free Messages account during the month. Give the name of the State with each office, and where there is more than one office of the same name in a State, specify the County.	CHECKS THIS OFFICE. Messages Sent.		THIS OFFICE CHECKS. Messages Received.	
	No. of Messages.	Amount.	No. of Messages.	Amount.

#7.—

Sup

Fig

ailer, from $2 to $10.

Blank No. 9.—See Rule LXXIV.

Southern and Atlantic Telegraph Co.

..... 187

Memorandum of Payments to be made at this office, (and when to be made,) during the Month of 187

When Due.	To whom Payable.	Amount.	For what Owing.
3,75			

I certify this Report to be correct .....

Blank No. 13.

THE SOUTHERN AND ATLANTIC TELEGRAPH COMPANY.

ERROR SHEET. *Office*

Month.	You differ with	Checks You. This Line.	Checks You. Other Lines.	Per Cent.	You Say. This Line.	You Say. Other Lines.	Per Cent.	You Say. Pal'l other Lines.	Office differing says you should pay.	Am't acknowledged and remitted.

No 12

SOUTHERN AND ATLANTIC TELEGRAPH COMPANY.—Monthly Report from _____

TELEGRAPH RECEIPTS.			
Day	THIS LINE.	OTHER LINES.	TOTAL.
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
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27.			
28.			
29.			
30.			
31.			

ACCOUNT CURRENT of _____ for the Month of _____ 187

Telegraph Receipts—This Line.....

" " Other Lines.....

Total Telegraph Receipts.....

Check Errors Month of.....

Cash from Quotations .....

" " Specials.....

" " .....

" " .....

" " .....

" " .....

" " .....

" " .....

No. of Cable Messages sent.....

GOLD.

Cable Receipts.....

Amount paid other Lines.....

Refunded and Uncollectable. This Line. Vouch. Nos.

" " Other Lines.....

Total Refunded and Uncollectable as per Messages and Envelopes enclosed ...

Salaries, Operators. Vouchers Nos.....

Do. Clerical. " " .....

Messengers..... " " .....

Rent..... " " .....

Light and Fuel.... " " .....

Battery..... " " .....

Expenses.... ... " " .....

Total Office Expenses.....

Repairs Line.....

By Cash Deposited with.....

By Cash remitted Treasurer.....

By Gold Check remitted Treasurer.....

I Certify the above Report to be Correct,

In Charge.

(1876.) A. Co., 21 Pine Street, N. Y.

A36

General Record Book = say Charleston

SOUTHERN AND ATLANTIC TELEGRAPH COMPANY.

No. of Message	TO WHOM ADDRESSED.	TO WHAT PLACE	SIGNATURE.	FROM WHAT PLACE	No of Words.	TOTAL CASH RECEIVED.	NAME OF OFFICE. Checked in Account with	CHECKS THIS OFFICE. This Line	CHECKS THIS OFFICE. Other Lines.	THIS OFFICE CHECKS. This Line.	THIS OFFICE CHECKS. Other Lines
5	John Smith	Savannah	John Brown	Charleston	20	1 00					
6	John Doe	do	Richard Roe	do	10	– 50					

The day's business at each office is entered as fast as it comes in, in Blotters, & at the close of the day the messages are classified so far as to put all that have been sent from any one place to any other place, & then the same are entered in this Book, in regular & connected order – ruling between the different places where messages have been sent.

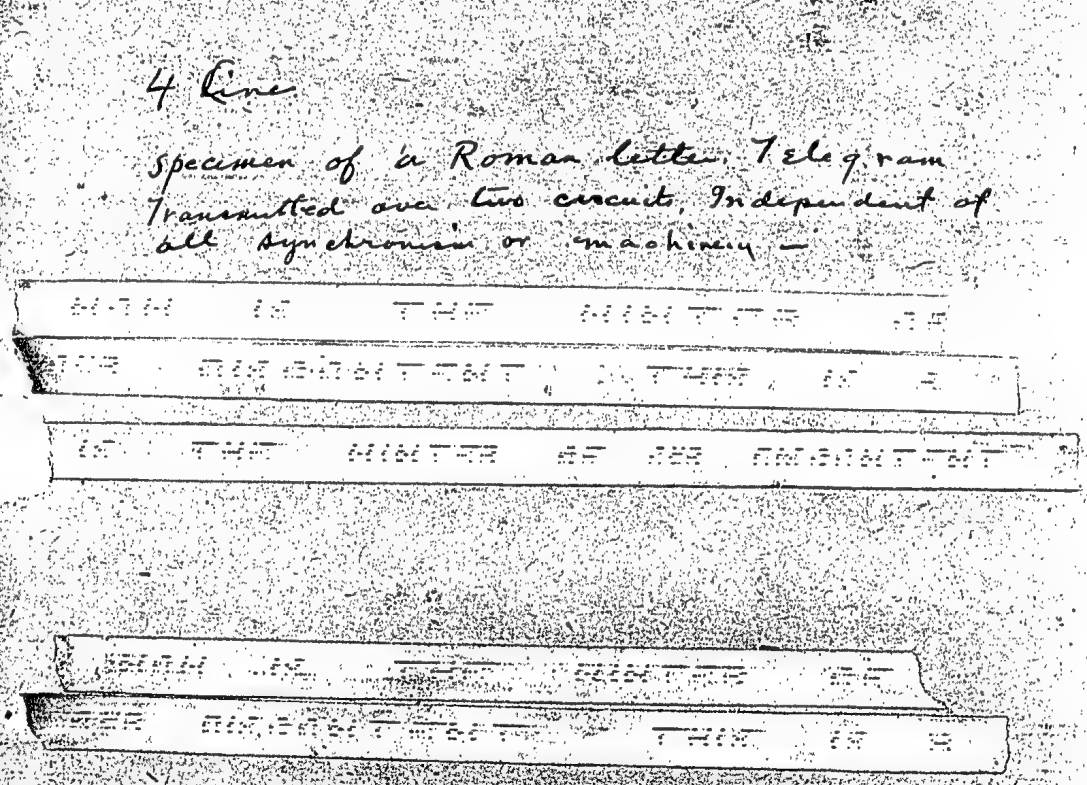
Very sensitive — Chl Sod — not good

Auro Chloride Sodium Nitrate ammon
Tin Per — Can interior with Iron

Purple of Cassius

4 Line

Specimen of a Roman letter. Telegram
Transmitted over two circuits, Independent of
all synchronism or machinery —



Specimen 600 w a minute from Paris received at NY from Phila 100 miles

3 Lines

Specimen of a Roman Letter word Transmitted over two circuits without the interposition of timing machinery

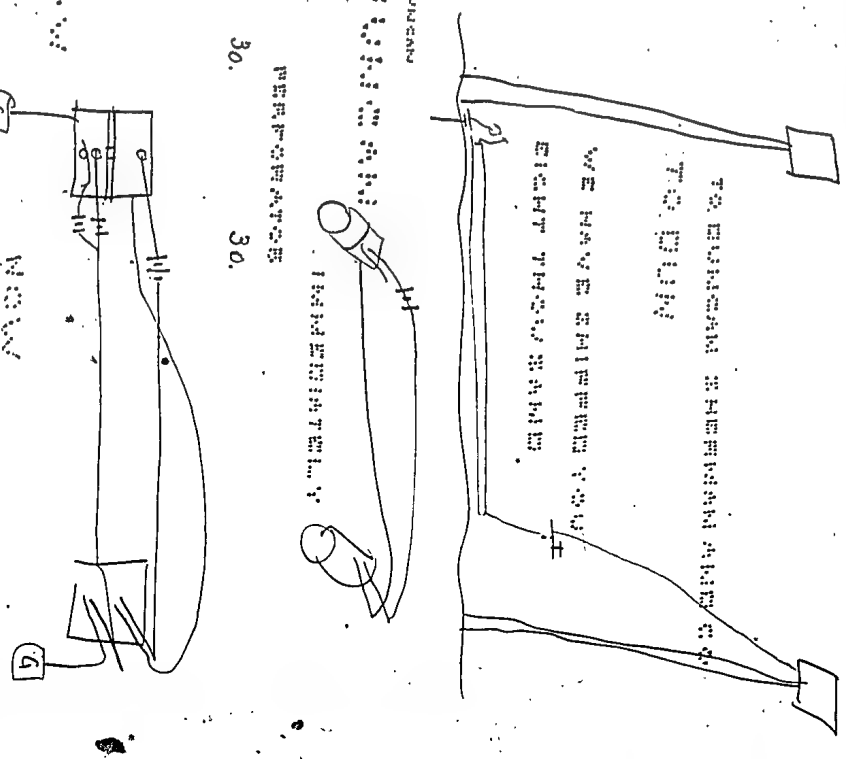
MACHINE

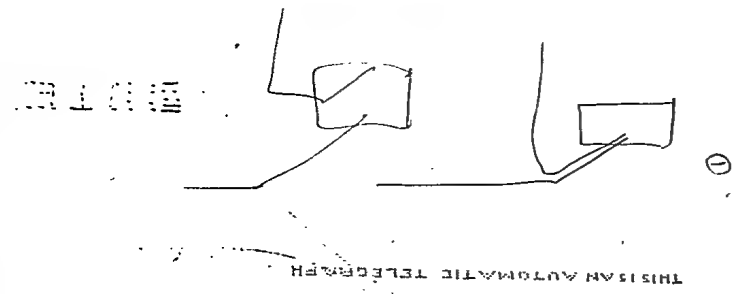
MACHINE

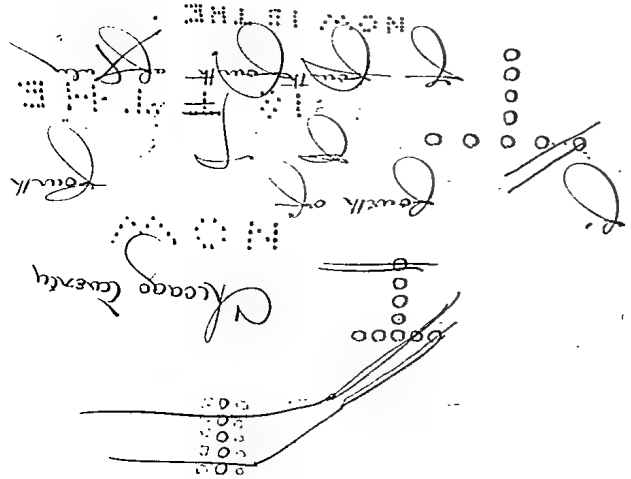
MACHINE

MACHINE

MACHINE

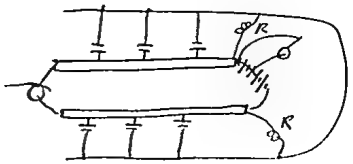




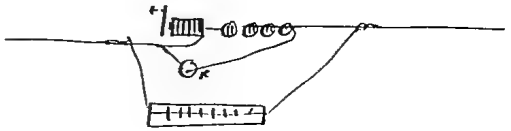


Shellac Thickly Receiving roller for 4 line printing. 2. Pens set ahead other two half or a half letter Copy setting ahead two letters

Try two Static Lines thus



In the ~~two~~ Same direction Duplex shunt The Common Relay with plain & Secondary battery — to kill all discharge. Then Shunt that with Compensating Box Lunah S Thus



Try it on static Line

Try this Duplex on static Line & tell pepl

1/2 salt 1/2 gallon Water. the solution

Dipped in

Hydrosulf Am. little very black mark

" " excess " " " no better

Nitrate Silver no effect

Nit Silver, Hydrosulf Am, & Acetic Ac. no effect

Nit Silver & Ferricyanide no effect

Spts Camphor " "

Per manganate Pot " "

" " " & Acetic Ac. " "

Phosphate Soda " "

Carbonate Amm " "

Aqua Amm " "

Sulphurous Ac. " "

Pyrogallic Ac. faint mark at first comes out very black

Lumus no good.

Silicate Soda very slight brown mark.

Peroxide Iron no good

Bichloride Merc. " "

Chloride Cobalt " "

Pot. Sulphs Cyan " "

Benzoic Acid "

Nitro prusside of Sodium "

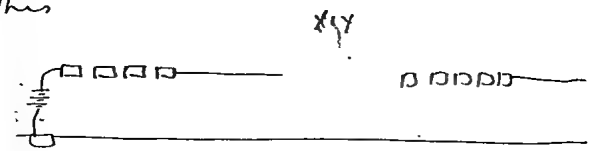
Caustic Potash light brown mark fades out

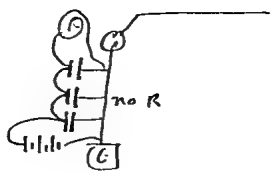
Testing for test for

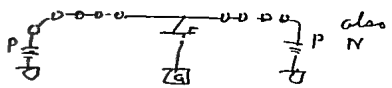
Phenol-oxide Iron

It is possible that if 40 at recg end cups were kept permanently on the Cable the signals could be read with 10 thrown in cups at sending end, without big chk better than if the whole 50 were used in ordinary way.

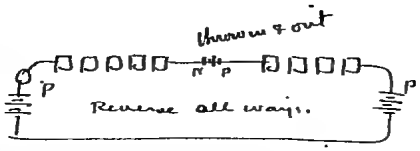
This







ahead static

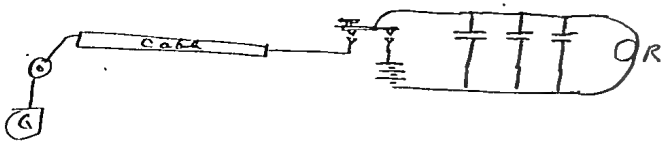


also N

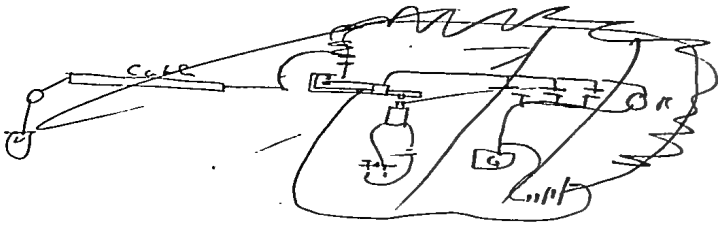
Recording with a Condenser

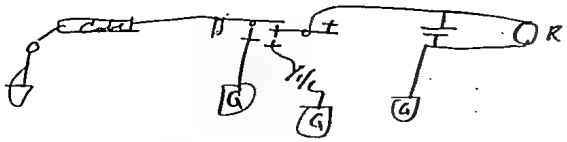
I think with Shellac Recg drum and pens set little ahead that by using 12 Cups Each lines to drums, and shunting batteries & putting in R of 500 ohms Each line it will work. Shunting batteries is for the purpose of throwing backing down according to the Resistance & not feed second round & make the same mark.

Use the static charge to work the Cable thus -



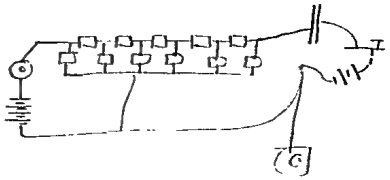
If want put end to ground use duplex Key thus

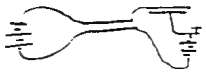




(N)

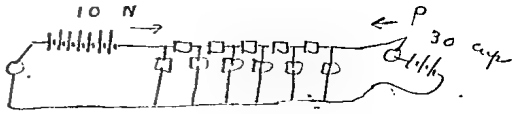
Cable





See what speed obtainable on 9000 ohms R with 1. cup battery. Iodide, if no mark expmt on iodide paper till get a mark.

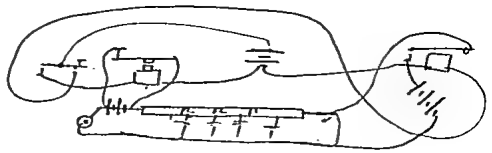
Try this



(O)

also test if a voltaic battery put in circuit immediately after the dot has been sent & the sending end insulated, will have any

any effect in stopping the flow from the Condensers, use same number of Elements to Kill discharge from Condensers as to send with if it has no effect. Then it is perhaps possible to transmit with Voltaic & Static at same time and perhaps static Compensation or reversals of static is better than Voltaic Try with 20 P Reg end 20 P Sec. Thus

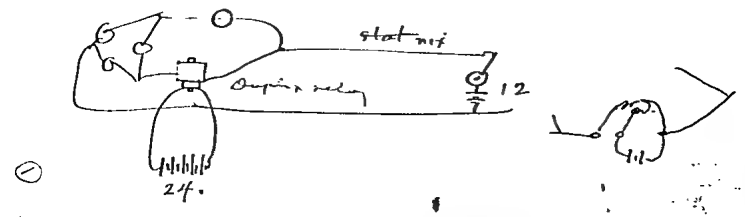


Now try all both batteries with discharging shunt of high R at sending End So as to Enable Secondary to send an opposing Current see if much difference =

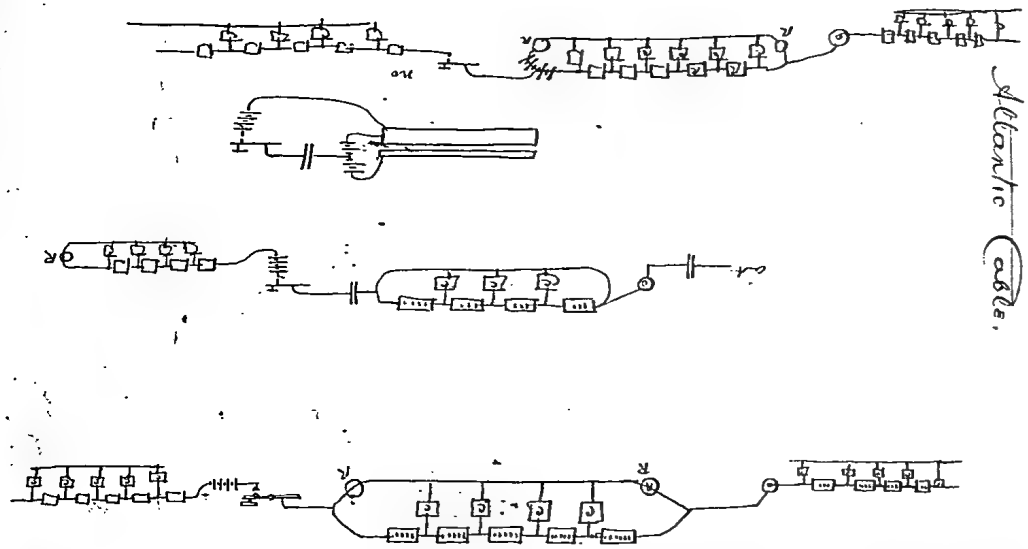
I have noticed the a Morse Relay on a regular line works much sharper with battery at both ends than when the battery is at one End only

when the latter is used the N's ... etc stick just as if Caused by static. The battery at receiving end remains of Course on line while the other is off when the key is opened this may have peculiar Effect on the retention of the Charge or the quicker discharge — Try it =

Ascertain if the induction from a relay is as great with the core nearly saturated with magnetism as free. Thus



The Currents going in ~~both~~ same directions 24 making N S. & 12 adding to Try what Effect 24 mkq N S & 12 mkq S N



Atlantic Cable.

(2)

Lemuel W. Serrell's
OFFICES FOR PROCURING
American & Foreign Patents,
119 & 121 NASSAU STREET,

(P. O. Box 4689.) New York, Octr 6 1873.

T. A. Edison Esq
Dear Sir

The cups of liquid with copper conductors in them are shown in your patent 141,776 in the branch to earth, and also condensers and batteries: The cups are shown in main line in No 141,773 but not in any that I discover are the shunt cups and resistance introduced as proposed by you when last you were here: the way is clear I think —

The other chemical cases are ready for examination and signature.

Yours truly
Lemuel W. Serrell

46

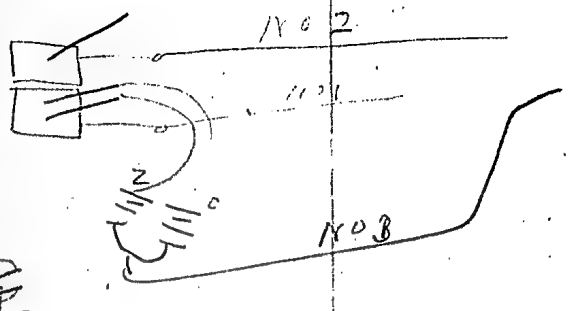
Test the induction on a clear line of the relay in the balance.. Then with a line of same R but fixed staticly test the amount & character of the induction from same relay. The object being to see what effect the gradual decrease in the strength of the main will have upon the inductive wave.

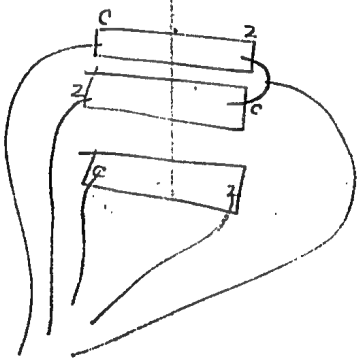
Try same with Secondary batteries

Make 4 bottles Secondary battery. place in balance, first fill with 4 pennyweight of Muriate ammon – Then

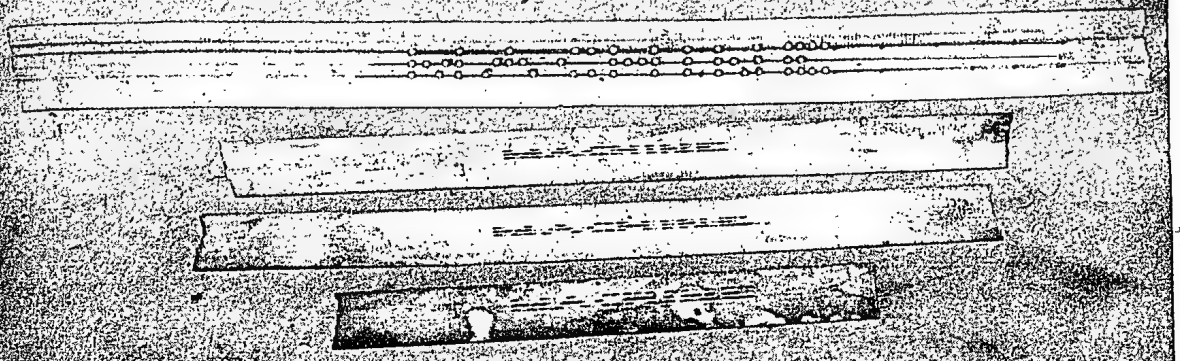
Sul Soda.
Alum
Bichrom Pot
Iodide Pot.
Nitric A. 5 drops.
Salt.
~~Nitrate Ammon~~
Liquid Ammon

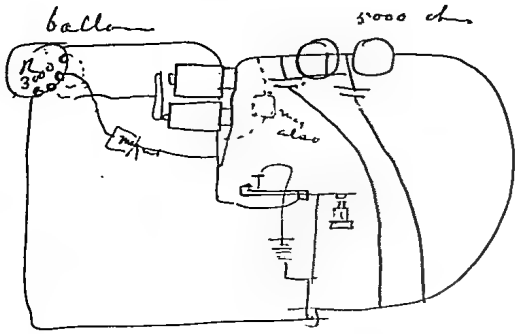
& Several Other Chem
See what phenomena accompanies the different Chemicals
~~Citric Acid.~~
Sul Cop.
Sul acid
Ferrid –
Sul Zinc



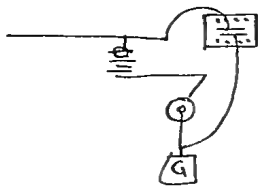


2 wires



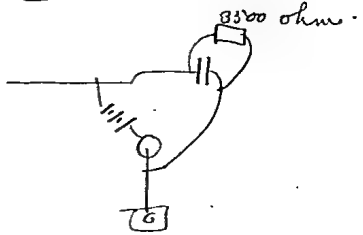


Send to Washington with this arrangement

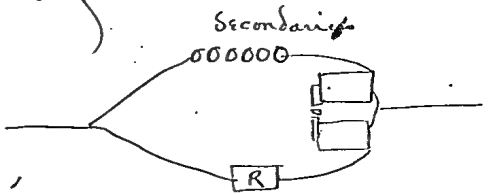


get 50 cups in order

also.



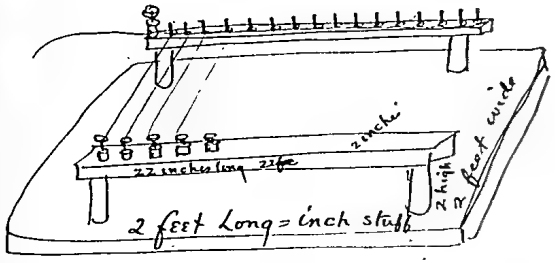
Try this



Try this Duplex

Thus

Have old man make this.



40 Burdung pasts small = parafined all over =

Have Tom parafine Glass "Rhios" =

HERE WFSZAOJTFASVN AA VERY NISE RUM THEY SELL THER CHEESE AND TRENTON KRACKERS ON END BAR YZ

built for Mr. Henry Morel, of the *Société de la Lys*, of Ghent.

Messrs. Thorneycroft and Co. have made a specialty of these high speed boats, and there appears to be constantly increasing demand for them. The firm are now constructing some of these launches with compound engines.

PERIPOLAR INDUCTION.

Those of our readers who have attended the very interesting lectures delivered by Professor Mayer, of the Stevens Institute, Hoboken, N. J., on the subject of magnetism, will remember the striking experiments which he performs with the aid of the huge electro-magnet belonging to that institution and a disk of copper suspended so as to freely swing between its poles. When the magnet is uncharged, the plate vibrates, like a pendulum, from side to side with perfect readiness, retaining its motion for some little time after the impelling force is removed. If, however, a current is established, converting the masses of iron into actual magnets, the vibration of the plate is almost instantly stopped; an invisible resisting medium appears to have been formed between the poles, through which the disk is unable to pass, or, if forced through, acts, as Professor Mayer expresses it, "as if it were penetrating cheese."

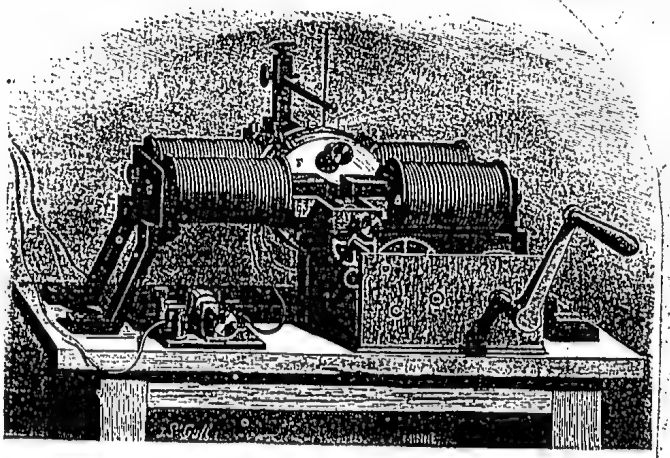
On conducting an experiment somewhat similar to this, Faraday was led to the conclusion that the arrest of the copper plate was due to induced currents produced therein. In other experiments, which we will not here describe, the existence of these currents was demonstrated by the direct exploration of a disk of copper turning before a magnet, an operation which defined the paths of the currents with certainty. Foucault modified Faraday's mode of investigation by arranging his plate of red copper on a horizontal axis, and revolving it by suitable mechanism at the rate of 10,000 turns per minute. The disk passed between the two extremities of the soft iron core of an electro-magnet, in which a current could be established at will. As long as the latter remained broken, the plate, when swiftly rotated, would retain its motion for some time; but as in the case already cited, a prompt stoppage followed the establishment of the electrical flow. Foucault intended not simply to reproduce Faraday's experiment, but he wished to study the results incident to the application of a force sufficient to continue the rotation of the disk in spite of the obstruction. It was found that, to accomplish this, considerable mechanical energy must be expended, which could be calculated and which reached quite large figures. What became of the excess of work over and above that necessary to ensure the rotation of the disk, maintaining a given velocity (or, in other words, that rendered necessary by the effect of the current), was the question, and Foucault determined it to be transformed into heat. This conclusion was soon justified by experiment, as it was found that the temperature of the disk became elevated to a degree appreciable by the hand; and when the rotation was prolonged for two minutes and the current produced by six Bunsen elements employed, the melting point of wax could be attained.

We have now given, of the salient points of this study, enough to show its progress up to the present; for since Foucault's experiments, no particularly notable investigations have been made into the action of magnets on copper in motion. M. Le Roux, however, has recently devised the apparatus represented in our engraving, and, besides, investigated that which he calls "peripolar induction."

Supported by iron feet on a solidly constructed table are four coils of isolated copper wire, so arranged as to be connected with a battery by means of the commutator, C, by which the current is interrupted or established at pleasure. Within these coils are cores of soft iron, the extremities of which extend beyond the wire and form the poles of the magnet when the current passes. A disk of red copper, DD', is placed symmetrically in the center of the apparatus and parallel to the axes of the coils, and turns on a horizontal axis which extends between the opposite extremities of the iron, as at A. At this point is shown the pinion which, with other gearing, transmits the motion of the handle to the disk, so as to cause it to rotate 160 times per second, or about 10,000 times per minute. To the ends of the cores of the opposite coils and below are fixed two pieces of soft iron, F', between which passes, though without touching either, the copper disk, D.

Thus arranged, the machine forms a powerful Foucault apparatus, with which the experiments above indicated can be repeated. But above the cores of the magnets are placed other pieces of soft iron, F, arranged similarly to those marked F', which, we have stated, are fixed below. When this portion of the device is in position, all the pieces become magnetized by contact with the electro-magnets; and as is evident, the disk, D, in its entire extent, is submitted to the action of a magnetic field presenting the greatest symmetry in every direction. Here, however, the contrary of that which has been heretofore observed takes place; the rotation of the disk is as easily accomplished when the current passes as when the circuit is interrupted; and that the same resistance experienced in the Foucault apparatus is not here encountered is proved by the fact that the copper does not become sensibly warmed.

The current nevertheless passes, and zinc is dissolved in the battery. Here then is expended energy which should manifest itself somewhere. The study of the effects which should be produced by reason of the induction led M. Le Roux to admit the existence of a current running from the center of the disk to the circumference; and he proceeded to verify his conclusions. To this end, a vertical metal support is placed in contact with the axis of the disk, and a horizontal rod fixed to this support terminates in a copper wire, the end of which rests on the periphery of the disk. When the latter is turned, with no current passing, no especial effect is observed, except the slight warming of the copper wire by the friction. If, however, the flow of electricity be established, at that instant a continuous series of sparks leaps from the point of contact of wire and disk, thus denoting the existence of a very energetic current in the circuit formed by the disk, its axis, and the various pieces already described as arranged in connection therewith.



PERIPOLAR INDUCTION.

It is in the fact of there being this current, as predicted by theory, that M. Le Roux' idea of peripolar induction is based. No practical application of the discovery has been made; but it is very interesting, in that it confirms many theoretical ideas regarding induction. The machine represented was by Rhumkorff, the celebrated manufacturer and inventor of many physical instruments, and has been exhibited before many French scientific societies.

STEEL AL U CAN. WE PRINTING OPRS.NEVER WIL IN GODS WORLD MAK

ANY IMPROVEMENTS. SEND ALNG THT NEW RELAY. AND FR GDS SAK SEND

HF DOZ OF THEM.HERE.. WANT EM FOR THES.DMD WIRES.

CAN SAY THT NOW THT.ECKERTS ON BRINY DEEP. A UR.DMD OLD AB

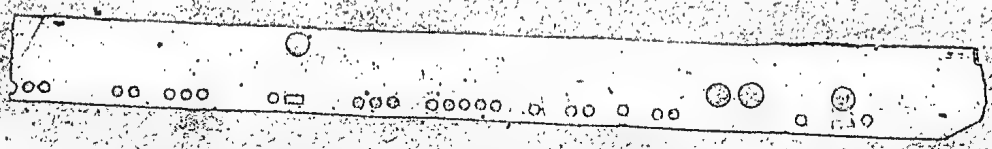
UR DMD OLE AROMATIC LINE HPUAAAGPVMAB UR DMD OLE AROMATIC

LINE GOT FOUL OF OURS TODAY.AND WE BUSTED.EM.UP AL DAY

OFS TO SEND.....ONE HUND.THOUS WDS.AN HOUR. BUT TH.EXAMINER.AND

OTHERS COMON SENSE.SAY HES A DMD.FUL.AND DNT NO ANYTHG ABOUT IT.

WHT U DRIVING AT NOW:ROYCEYZ PUZCH



MARSHALL LEFFERTS, President,
NORMAN C. MILLER Sec'y & Treas'r.
GEO. B. SCOTT, Sup't,

The Gold and Stock Telegraph Co.
Executive Offices, No. 61 Broadway,
New York, 187

J. B. Morley Esq

Dear Sir

I have written Patent for Austria - and assignment of same as per agreement May I beg you to send a check at once for the $8000. as I have been in expectation of this for at least three months, and I am in a very embarrassed condition

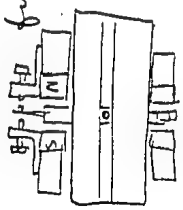
(1)

See what direction the discharge is from a coil of iron wire no core. — See if a solid iron coil will attract an armature at the end.

On Bottle or Glass Rheo tube Cone,
See if judicious placing of fine rings as leaks equal to combined water will completely neutralize outflow or reason current = see what proportion it takes

Cleer get artificial 10 Condens & R Boxes see what is lowest amount of leakage of magnets along it will completely clear line.

Have a Galvanometer Relay made.



fine points
50 Cups small Sul Cop similar to work fine wire powder
Finish on

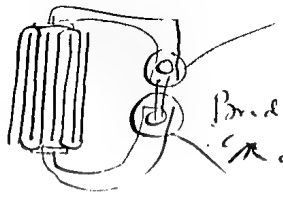
(2)

Problem – Get a relay to send a Current Opposite to what it does now

See if a Relay Opool of iron wire dont send as much induction as one with Copper wire if so the iron has advantage of having more resistance,

See if Relay sends more induction with immense piece of iron in Contact with Rack – also with front. Try effect of piece of brass between Armature & Cores – see what Effect on induction also on reversals for Duplex in same way

C

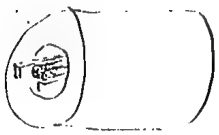


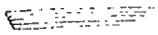
Bridge Wheel iron
Magnetic Condenser

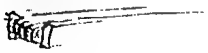
Connect one armature tin foil Condenser to one pole magnet & other armature to the other pole =

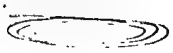
Wind a Relay Magnet with long roll tin foil.

Sheet iron plates 10 feet long

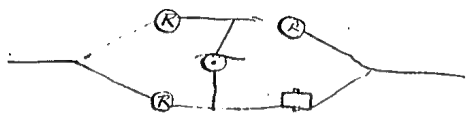


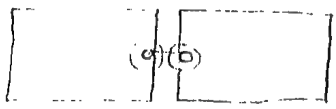


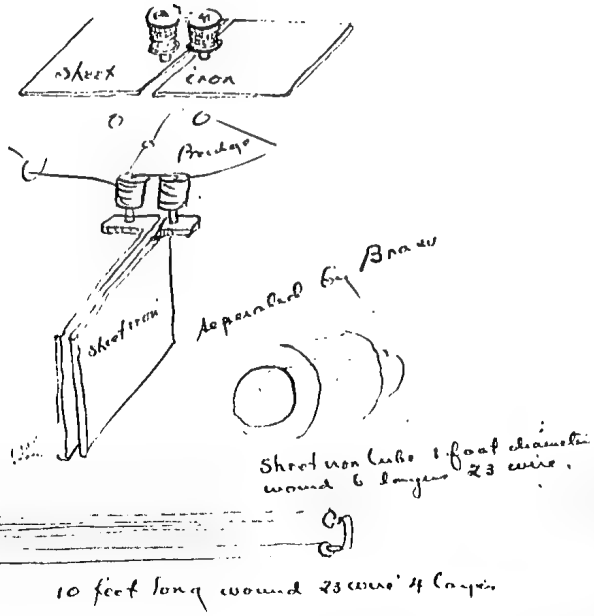


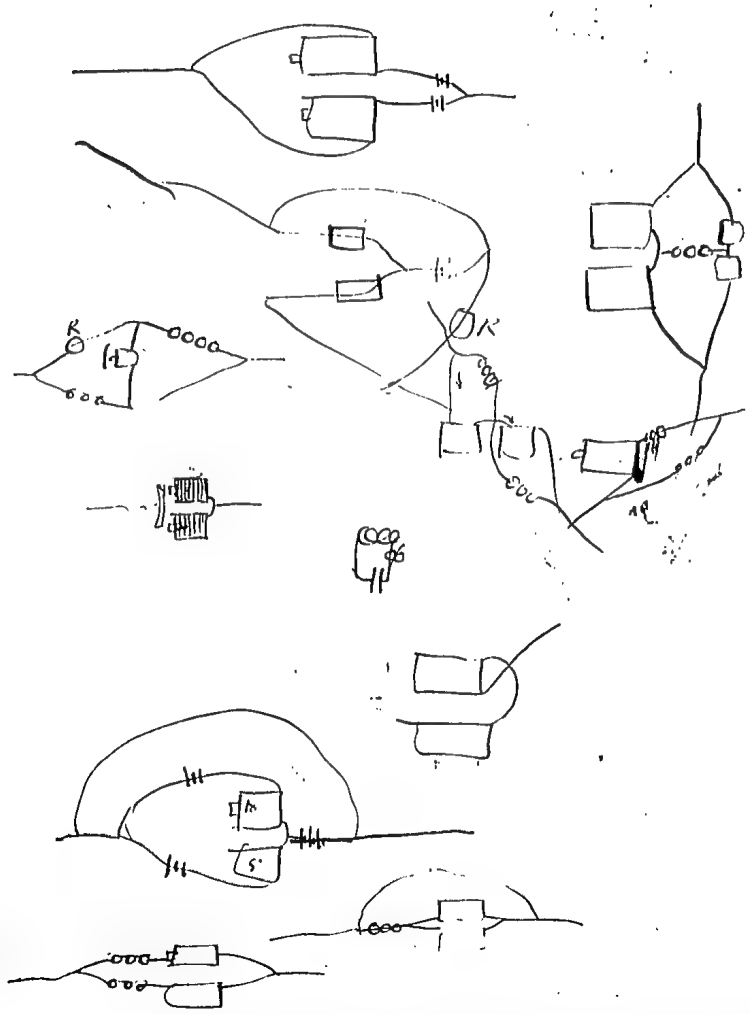


Try following Experiments upon the induction Effect of magnet. made as follows in Bridge

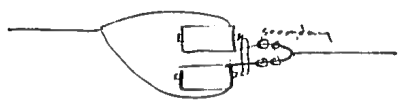


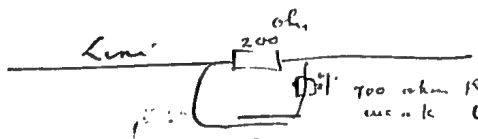






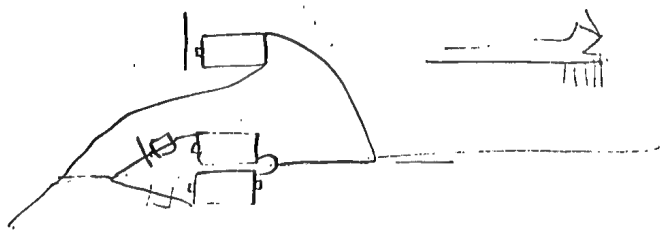
See if ~~Static~~ Discharge Killed with this and if there is any Kick to Relay

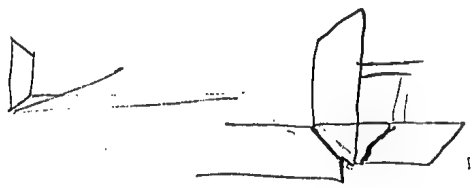




700 ohm Relay work well but weak W & Ney same adjustment

Large C



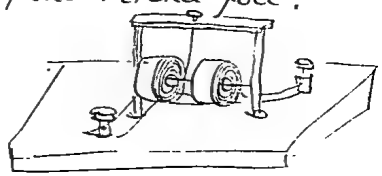


Try one cell secondary with clean coppers with distilled water and Iod Kali – also replace coppers with platinas or Carbons.

Associate with the iron receiving pen a platina pen very close to it so that the oxygen set free at the platina pen shall form the protoxide on the iron. Theory being that iron when so associated is more susceptible of oxidization, also probability that $\frac{1}{6}$th of effect is lost by polarization iron pen which will be destroyed by the associated platina pen

Ascertain if anything will combine with protoxide iron to make it soluable in water if so add to Calland battery to dissolve the yellow sesquioxide on the zinc due to the iron in the zinc. The N J Zinc works abstract their zinc from a Compound containing iron pyrites & considerable percentage iron remains in their zinc

Wet paper galvanometer – wind two bobbins 50 feet paper in solution Chl Sodium and wind seperating with oiled silk, thin rubber cloth or gutta Percha foil.



In a galvanic battery try outside. Chloride Sodium and Carbon. in porous pot. Solution nitrate Silver and carbon. use new carbon & new porous pots – also replace carbons with platina if unsatisfactory. Theory being precipitation of the Chloride by the nit Silver will set up an active Current.

Try. same but use cold Chl Sod outside & boiling hot Chl Sod inside porous diagram

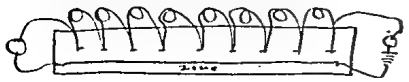
Try wet paper — sulphuric acid. and nut galls. on the passage of the current, protoxide of iron is formed. The sulphuric acid combining therewith forms protosulphate of iron or copperas, the nut galls will then strike an intense black forming common ink —

Make a Zamboni dry pile,

Make a condenser of sheets of copper and sheets of thin stove zinc.

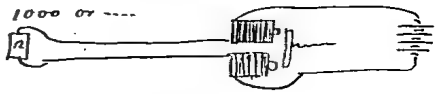
Try Electrotypers plumbago rubbed on parafine sheets for Condenser

Make trough one side place long sheet zinc at intervals carbon. Try effect.

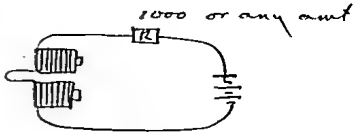


Try 1 Cup then increase. see how many it

See if there is a noticeable effect produced. in these modifications



and.



Theory being that in the centre of resistance or bulk of Conductor. there is a nil point and that each side from that point the R is P & the other N ~~or~~ & that a battery on a R should if it is strong attract a finely balance magnetized needle to connection wire at zinc end its N end & at Coke end its P end Try it =

C
Z
1
2
3
4
C
Z

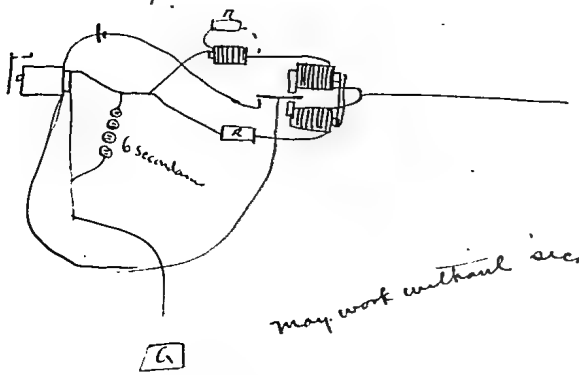
Rheo

Try all the secondaries connected for quantity on a R of 500 m. 6500 ohms.

13
1500
4.00
6500

in the centre 3250. Connect all the secondaries to ground or return and the other end to R through an R of 250 000 ohms. See the Charge due to Secondary Action Use wet string

Duplex



may work without secondary

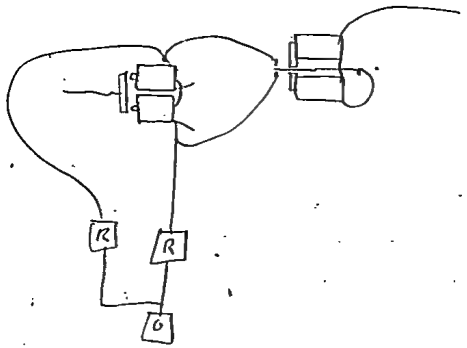
The Cross of the polyd R might be made to short ckt the Secondary when open.

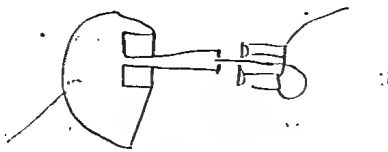
takes to neutralize = use pure water first then Ch. Sodium.

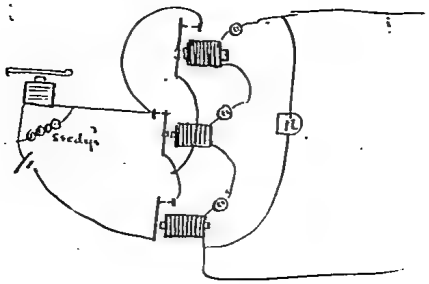
A galvanometer needle hugs the stop pin after the current has ceased. Theory. the needle being thoroughly becomes charged P one end N other end statically & is attracted by pin - try connecting pin with grounded.

On a shop line statical get its R. carefully Then insert a leak of know R in Center. and get total R. I believe that in a submarine Cable that there is a constant appearing Electromotive force in the Core against the battery & that they do not get the right R of the Core.

7







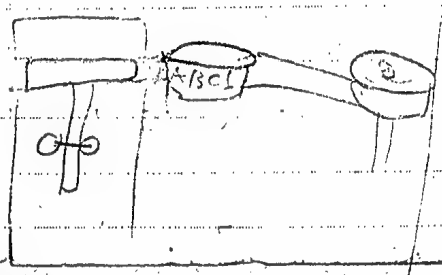
Station: Berlin. Französische Str. 33

Wird eine Verstümmelung in der Depesche vermuthet, so wolle man sich sofort an die Station wenden, welche das Erforderliche veranlassen wird.

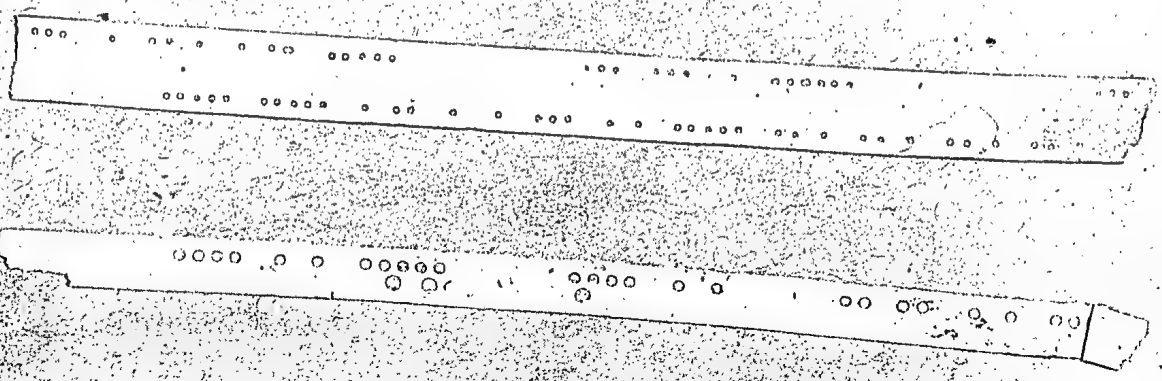
Telegraphie des Deutschen Reiches.

№ 80

/berlin hamburg 3633 20 10/2 6 20 s = frau meisinger burgstrasze 14 berlin = ich erwarte georg morgen bestimmt clemens reist bereits mittwoch frueh telegraphiret wann georg eintrifft = wilhelm



VOICI UN MODEL D'OUVRAGE FAIT PAR LE SYSTEME DE TELEGRAPH AUTOMATIQUE A TYPES PAR M EDSON.



No. of Message 584

Charges to pay £ 5 16

POST OFFICE TELEGRAPHS.

Regulation as to Inland Telegrams.

If the Receiver of an Inland Message doubts its accuracy, he may have it repeated on paying half the cost of its transmission to him. In the event of an error having been made, the amount paid for repetition will be refunded on application to the Secretary.

Office of Origin Chicago Handed in at 6 44 p.m. Sent out at 6 32 p.m.

Delivering Office.

From

To

FROM J C WRIGHT NTH WESTERN HOTEL LPOOL TO T A EDISON NEW HUNNUNS COVENT GARDEN LDN -

PORTERS IN SENDING PORTMANTEAU UP ELEVATOR LET IT FALL & SMASHED BOTH INSTRUMENTS BADLY WILL B

ABLE TO GET ONE GOOD ONE OUT OF THE TWO & HAVE READY FOR FRIDAY MORNING WHEN WE ARE TO

HAVE WIRE SEND A BELT

25	1/3
30	1/6
35	1/9
40	2/-

When the cost of a reply to a Telegram has been prepaid, and the number of words in the reply is in excess of the prepayment, the sender of the reply must pay for any excess of words over the number so prepaid.

Telegrams may be re-directed from town to town at an extra charge of *one-half* the ordinary inland tariff, fractions of threepence being reckoned as twopence, but in such cases they must not have been opened.

N.B.—It will materially assist the Department if, in making any inquiry respecting this Telegram, the Applicant will enclose this form in his Letter. In the case of a Foreign Message, the application should be addressed to the Administration to which the Message was handed in the first instance.

Jas. Truscott & Son, London.

.. HA. HELO EDISON:WHT TH HEL U PROWLING AROUND THESE COMEN. INSTS. FOR

U GOIN IMPROVE ON EM. THERS FELR. JST GOT PATENT OUT IN P

THIS IS A SPECIMEN OF
EDISONS AUTOMATIC
CHEMICAL PRINTING
TELEGRAPH TRANSMITTED
AT TWELVE HUNDRED WORDS
PER MINUTE.

DIESES IST EINE PROBE DER SCHRIFT DES
ELECTROCHEMISCHEN TYPEN TELEGRAPHEN
VON HERR EDISON DIESES

THIS IS A SPECIMEN OF
EDISONS AUTOMATIC
CHEMICAL PRINTING
TELEGRAPH TRANSMITTED
TWELVE HUNDRED
WORDS PER MINUTE

ELECTROVE CHEMIQVE TYPES

R.A.R. N. EDISON [illegible] VOICE UN CHOOSE

THIS IS A SPECIMEN OF EDISONS

OMATIC CHEMICAL PRINTING TELEGRAPH

WORDS PER MINUTE

Three months after date for value received I promise to pay James G. Jones or order one thousand dollars with interest at five per cent,

Peter Payroll
Cash'r.

New York Sept. 28, 1875.

THE

Electric Railroad Signal

Office, 38 Vesey Street,

NEW YORK,

MANUFACTURERS OF

SEMAPHORIC DISTANCE SIGNALS WITH REPEATERS,

AUTOMATIC BLOCK SIGNALS, SPECIAL SIGNALS

FOR TUNNELS, DRAW-BRIDGES, STATION

YARDS, CROSSINGS AT GRADE,

SWITCHES, etc.

PATENTS OF F. L. POPE AND S. C. HENDRICKSON.

J. N. Ashley, *Business Manager.*

F. L. Pope, *Electrician and Sup't.*

Russell Raymond, Printers, New-York.

Electric Railroad Signal Company.

This Company, having perfected a complete system of Electric Railroad Signals, is now prepared to furnish the necessary plans and estimates, and to erect their improved Electric Signals at any point in the United States or British Provinces, upon short notice and upon the lowest terms consistent with a proper regard for thoroughly good and reliable workmanship and competent superintendence. The Company guarantee all instruments furnished and work done by them to give entire satisfaction. For the Automatic Block System, railroad crossings at grade, draw-bridge, switch and tunnel signals, they have the only *Reliable System of Electric Signals* yet offered to the public.

These signals are not an experiment, being now in successful practical operation on several railroads.

This system of electric signals is fully secured by a number of patents already granted in the United States and other countries, and by others now pending, which are owned by the Company, which will maintain its legal rights to the fullest extent against all infringers.

This system of Signals was awarded the DIPLOMA and PRIZE MEDAL for the best System of Railroad Signals, at the Cincinnati Industrial Exposition of 1872.

The following is a brief description of our system of "Semaphore and Repeating Signals," which is specially adapted to single track roads, grade crossings, junctions, draw-bridges and tunnels:

Electric Semaphore with Repeater.

The accompanying illustrations will serve to explain our improved system of Electric Semaphores and Repeaters.

The external appearance of the Semaphore, as usually constructed, is shown in the front elevation (fig. 1), and the side elevation (fig. 2). It is placed on a post at the right hand side

Fig. 1. *Fig. 2.*

of the track, at a suitable height above the ground; the signal being exhibited through two openings, usually about twelve inches in diameter, covered with glass, and illuminated at night by a lamp fitted with a reflector at the back of the signal box.

The interior mechanism of the Semaphore is shown in fig. 3.

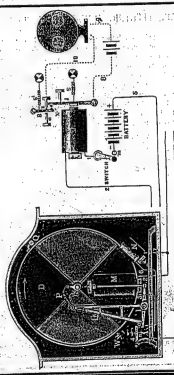


Fig. 3.

D is a disk about thirty inches in diameter, divided into four segments, alternately white and red. An adjustable counterbalance weight, W, attached to the periphery of the disk, keeps it in the proper position to show white, indicating safety, except when under the influence of the electric current; or it may be arranged to show red by the action of gravity, in which case a signal can only be shown when the machinery and battery are in perfect working order.

The disk is made to turn through one fourth of a revolution by means of an electro-magnet, M_1, the armature, A_1, which is attached to the short arm of the angular lever, L_1, having a fulcrum at 1. The long arm of this lever is connected by the pitman P with the crank K_1 on the axis of the signal disk. Thus the disk will turn and show a red signal whenever the magnet M_1 is charged by the electric current. N is a supplementary magnet, for locking the signal in position when an red, as hereinafter explained.

The apparatus at the station may be at any required distance from the Semaphore. It consists of a secondary or station signal—which, in principle and external appearance, is a miniature copy of the distant Semaphore—a differential relay and a signal switch, for operating the Semaphore, as represented in figures 3 and 4. The battery for working the entire apparatus

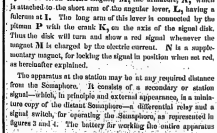


Fig. 4.

is also placed at the station.

The operation of the apparatus is as follows: If it is desired to set the distant Semaphore red, the signal switch is turned on the stud s_3 (see figure 3); a circuit is thus formed, from the main battery through the switch, wire 1, magnet R of the differential relay, wire 2, Semaphore magnet M_1, wire 3, circuit changer 4, and wire 5. The magnet R attracts its armature strongly, bringing the lever J into contact with B_2 and thus forcing the latter against the stop c_1, so that the local circuit which operates the small signal is broken at x_2, notwithstanding it was at the same instant closed at x.

At the same time the magnet M turns the semaphore disk D in the direction shown by the arrow. Just before the disk D completes its movement, and after the red signal has been fully exhibited, a projection at a_2 on the lever L_1 comes in contact with a corresponding projection on the circuit changer 4, and lifts it up, breaking the previously existing electrical contact at N_2 which cuts the battery current off from the magnet M_1, and instantly transfers it to the locking magnet N. This occurs just as the soft iron armature Q on the disk comes in contact with N_2 and the latter, being now strongly magnetic, solves Q with great force, and locks the signal disk firmly in its new position. The magnet N is, however, wound with a much finer wire than M_1, and the insertion of this great amount of extra resistance in the circuit weakens it to less than half its original strength in the relay R. When this occurs the spring s^4, which is adjusted with a strong tension, pulls the lever J away from the relay magnet until it is itself arrested by the stop c_2. At this juncture the local circuit is completed through wires 8, 9 and 10, and levers B and B_2 and the station signal turns to white, also, repeating the movement of the semaphore.

A careful study of the arrangement will show that it is no possible event can the station signal change, unless the distant semaphore has previously changed. The accurate repetition of the distant signal is rendered *absolutely certain.*

To work one of these signals at a distance of a mile requires but ten or twelve cups of battery, and the expense of battery material does not exceed

FIVE DOLLARS PER ANNUM.

This is the most effective and generally useful signal ever introduced. Its applications are almost innumerable. We have only space to refer to a few of the more important ones:

FOR DESPATCHING TRAINS.

The Philadelphia and Erie Railroad has, for several months, employed these semaphores for controlling the movements of trains over a single track between Sunbury and Northumberland, Pa., dispensing altogether with the written telegraphic train orders formerly used. An important saving of time is thus effected, as the despatcher, on being notified by an electric bell that a train is ready to start from the other station, merely gives the engineer a white signal on the Semaphore, and the train moves forward at once. Under the ordinary system two or three minutes would be consumed in transmitting and repeating the telegraphic order, and in getting the signatures of the conductor and engineer. Where the number of trains is very great, this is often an important consideration.

FOR STATION YARDS AND JUNCTIONS.

The most complicated arrangement of switches may be provided with self-operating signals, so that the movements of any one, or any number of switches will exhibit a danger signal at every point required to be guarded, and a safety signal at every other point, the whole being so arranged that *no safety signals whatever* can be exhibited in case of the apparatus failing to operate. The position of every signal, and consequently of every switch, may be indicated at any required place. This arrangement is especially valuable at junctions of two or more double track roads.

FOR GRADE CROSSINGS.

the two sets of signals are arranged to work from the same battery, which can therefore be put in connection with but one pair of signals at a time, rendering it utterly impossible to show a safety signal on both roads at once. If, then, the signals are properly observed, no possible carelessness or negligence can involve trains in a collision.

FOR WAY STATIONS AND CURVES.

There are many places where it is an almost daily necessity to send a man out a long distance from a station to flag expected trains. In such places a permanent signal of this kind not only saves much time and trouble, but also conduces to the safety of trains.

There are special applications of this signal almost too numerous to mention, which will readily suggest themselves to the experienced railroad superintendent. We employ experienced engineers and electricians, who will design special arrangements to meet any required conditions, upon application to the Company.

THE AUTOMATIC BLOCK SIGNAL.

After years of labor and experiment, we are at length prepared to offer a satisfactory **Automatic Block Signal**, based upon the Pope patent of 1872, which covers the use of the *track itself*, as an electrical conductor for operating Semaphoric signals. Having thoroughly tested this system in practical use, we are now prepared to supply customers for its introduction in any part of the United States or British Provinces, and to guarantee it to give entire satisfaction. This system is designed more especially for double track roads, and absolutely prevents trains following each other on the same track—from approaching within a stated distance of each other.

☞ *In case a train breaks in two, and a portion of it is thereby left standing on the line, the signal will indicate the fact to the following train.* No other system is capable of doing this. ☜

This system, either alone or in combination with the repeating Semaphore, is especially valuable for tunnels and single track bridges.

ARE ELECTRIC SIGNALS RELIABLE?

Undue prejudice has hitherto existed against electric signals among railroad men, in consequence of their liability to get out of order unless kept under the constant supervision of a skilled electrician. This difficulty has been in some cases partly owing to the unskilful construction of the signal machinery, but in a far greater degree from the lack of a suitable battery adapted to this service. It is only within the last two or three years that any battery has been available for such purposes, capable of maintaining a constant and absolutely uniform electric current for months at a time, without any attention whatever.

THE EAGLES METALLIC BATTERY

has been found to be peculiarly well adapted for this service, and is now usually employed in working the signal. It is shown in perspective in fig. 5, and in section in fig. 6. It consists

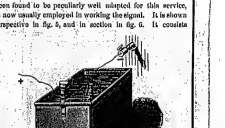


Fig. 5.

merely of a containing vessel of sheet lead, in which is placed five or six pounds of sulphate of copper. This is covered with

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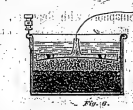

Fig. 16.

a layer of common sawdust, on which the zinc plate rests. This vessel is then nearly filled with a solution of sulphate of zinc. This battery is so extremely simple in construction and arrangement that the most unskilled laborer can readily be taught to manage it, while it will remain in action and give a strong and perfectly uniform current from three months to a year (according to the work done by it), without any attention whatever. The signal machinery itself, as may readily be understood from the description, is very simple, and can readily be comprehended and managed by any telegraphic operator.

We manufacture our own MACHINERY and APPARATUS, and for this reason its strength, durability and adaptation to the service to be performed are unexcelled. All the mechanism, especially that intended for station purposes, is of tasteful design and excellent finish.

For further information, estimates, etc., address

The Electric Railroad Signal Company,

J. N. ASHLEY,
Business Manager,

(P. O. Box 3803.) 38 Vesey Street, N. Y.

THE

Electric Railroad Signal

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MANUFACTURERS OF

SEMAPHORIC DISTANCE SIGNALS WITH REPEATERS,

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J. N. Ashley,
Business Manager.

F. L. Pope,
Electrician and Supt.

Russell Uhrbrook, Printers, New York.

Chemical Paper for Telegraphing

Solution.	Pen.	Mark	Remarks.
1 Sulphocyanide Pot. / Bichloride Merc.	Tin.	Slate	No mark at first but comes out strong after
2 Logwood / Sulphocyanide Pot. / Chloride Sodium	Tin	Purple.	
3 Chloride Sodium / Alcohol / Logwood	Bismuth	Purple.	

Log – Chl So. gives with Stannous stylus a mark with 1 Cup battery through 20 000 ohm – larger than Reg ferric –

Log Nitrate Ammon. Iron pen not delicate as Iron – delt Chl Calcium – in both cases more delicate than ferric –

Log – Chl Zinc bisterth stannous pen

THE REDUCTION RATIO FOR THIS DOCUMENT IS 14:1

Laboratory Notebook, Cat. 1175

This notebook covers the period November 1873 - July 1874. The laboratory notes and drawings are by Edison and Charles Batchelor. They deal primarily with automatic, printing, and chemical telegraphy; batteries; and general electrical experiments. There are also notes on the electromotograph. At the beginning of the book is a list of hours worked by the employees of the firm of Edison & Unger, probably for 1871. The front cover is labeled "Volume 7." On many of the pages there are faint page/volume numbers similar to those used in Unbound Notebooks, volumes 8-18. The book contains 219 numbered pages.

Missing pages: 1-80.

Cat. 1175

1873

| Date | | |

July	6	8	9	10	11	12	13	14	15	16	18		17 20
Miller	7	7-1		7	7-1	7-1	7-1	7-1		7	7	Miller	7 7
Bugmann		7-1		7	7-1	7-1	7-1	7-1		7	7	Bugmann	7 7
				7								Jarlow	7
		7-20		7	7-1	7-1	7-1			7		Wagner	7 7
Wagner		7-1		7	7-1	7	7	7-20		7		Frank	7 7
Frank	7	7											
Jacob	7	7-1		7	7-1	7-1	7-1	7-1		7	7	Christoffers	7 7
Christoffers	7	7-20											
Muehlberg	7	7-1		7-20	7	7							
Schaubel	7	7-1		7-20	7-20	7-1	7-40	7-1		7	7	Brand	7 7
		7			7	7-10	7	7-20				Muehlberg	7 7
	7	7-1		7	7-1	7-1	7	7		7	7	Mannsche	7 7
Brown	7	7-1			7-1							Brown	7 7
Bunkhorst		7-1		7	7	7-1	7-1	7		7	7	Bunkhorst	7 7
Osborne	7	7		7	7	7-1	7-1	7-40				Osborne	7 7
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											2		
											7		

1 Positive & Negative electricity. —

If a glass tube, being well dried, be briskly rubbed with a dry woollen cloth the following facts may be produced —

The tube being presented to certain light substances such as feathers, metallic leaf, bits of light paper, pieces of cork or pith of elder, will attract them.

If the friction takes place in the dark, a flame of light will be seen to follow the motions of the cloth.

If the glass be presented to a metallic body, as the knuckle of the finger, a common spark accompanied by a short cracking sound, will pass between the parts so near.

On removing the glass, no effect, a consequence will be produced, in that which is at rest when we touch it afterwards.

The same effects will be produced by the cloth with which the glass is rubbed, as by the glass itself.

Fig. 1

As an experiment to be made consisting of a small glass A 3 feet long & one inch in diameter, bent from pith of elder & suspended by a fine silken thread to a conducting stand.

If the glass tube B, after being rubbed, be brought in contact successively with a pith balls thus suspended, & then & hands from them a degree will be imparted to the balls in motion of which they will be repelled by the glass tube, when it is brought near them & they will in like manner repel each other when brought into proximity.

If the hand which holds the cloth be covered with a dry kid glove, the cloth after the friction with the glass will exhibit the same effects. If it be brought in contact with the balls they are discharged from them, & will be repelled from the pith thus suspended, & will not repel each other.

It appears therefore that by the friction the electric fluid is at the same time developed on the cloth & the glass.

Fig. 2

If a stick of sealing wax be brought into contact with one ball B, fig. 2, & the cloth with the other B, these effects will be observed. The glass when presented to the ball

B will attract it & the cloth presented to the ball B will attract it: & the balls will attract each other. It follows therefore, that the electricity developed by friction in the cloth differs from that on the glass, inasmuch as instead of being characterized by excess or defect, it is similar and mutually attractive.

The supposition that electrical effects are due to a peculiar substance has taken the form of two distinct forms. Some philosophers, following the Franklinian school, have supposed, (a) that there is only a single electric fluid, the particles of which mutually repel each other, but attract those of material bodies; (b) that this fluid is present, more or less, in all bodies in their natural state; & (c) that when any body contains either more or less than its natural charge of electric fluid, the excess or deficiency causes the body to perform various projections which are collectively expressed by saying that it is electrified.

On this view, it is supposed that when a piece of glass is rubbed with a woollen cloth, the cloth loses part of its natural charge of electricity, & thus becomes electrified positively or by deficiency: while the electricity which the cloth loses is accumulated on the glass, which therefore becomes electrified positively or by excess.

The pith ball B, (fig. 1) touched by the glass, receives the positive fluid from it, & the pith ball B, touched by the cloth, receives the negative fluid from it.

Since the contrary electricities are mutually attractive the balls B & B, in this case attract each other; & since like electricities are mutually repulsive the glass repels the ball B, & the cloth repels the ball B.

Of all known substances coal has in the most sensible degree of positive & perhaps gives off of negative. Between these extreme substances other might be so arranged that any substance in the list being rubbed upon any other that which holds the higher place will be positively, & that which holds the lower negatively electrified. The list is as follows.

1	Fur of cat	6	Glass	11	Sealing Wax
2	Flannel	7	Cotton	12	Amber
3	Ivory	8	White silk	13	Sulphur
4	Rock Crystal	9	The dry hand	14	Caoutchouc
5	Whale	10	Wood	15	Gun cotton

2 The third of producing electricity by glass & silk with amalgam:—

Experience has proved that the most efficient means of developing electricity in great quantity & intensity is by the friction of glass upon a surface of silk or leather moistened with an amalgam composed of tin (2) zinc (1) & mercury (4 parts) mixed with some mucilaginous matter. Let some fine chalk be sprinkled on the surface of a wooden tray into which the mercury should be poured hot. Let the zinc & tin melted together be then poured in, & the tray being closed & well shaken, the amalgam may be allowed to cool. It is then finely powdered in a mortar, & being mixed with mucilaginous matter may be applied to the rubber.

3 Degrees of conduction:—

Of all bodies the most perfect conductor are the metals. These bodies transmit electricity instantaneously, & without any sensible obstruction, provided their dimensions are not too small in relation to the quantity of electricity imparted to them.

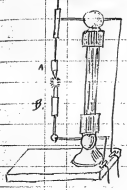
The bodies named in the following series possess the conducting & non-conducting property in a greater or less degree:—

Conductors	Non conductors
All Metals	Gum lac
Well burned charcoal	Amber
Plumbago	Resin

Conductors	Non conductors
Concentrated acids	Sulphur
Powdered charcoal	Wax
Dilute acids	Oil
Saline solutions	Glass
Metallic ores	Air & Atmospheric
Animal fluids	Blocks
Sea water	Diamond
Spring water	Transparent gems
Rain water	Raw silk
Ice above 32° Far.	Bleached silk
Snow	Oxygen
Living vegetables	Wool
Living animals	Horn
Steam	Feathers
Smoke	Dry paper
Steam	Parchment
Salts soluble in water	Leather
Rarefied air	Dry gases & air
Ashes of Charcoal	Baked wood
Tallow & Oil	Dry vegetable bodies
Most parts of stone	Porcelain
Powdered glass	Dry marble
Flowers of sulphur	Some precious & ornamental stones
	Camphor
	Gamboge
	Lycopodium
	Balsam of Copaiba
	Dry chalk
	Lime
	Phosphorus
	Ice below 32° Far.
	Many transparent crystals dry
	Ashes of animal bodies
	" " vegetable "
	Gets the hands the best
	Dry metallic oxides

H. Electric Light

Of all the luminous effects produced by the agency of electricity, by far the most splendid is the light produced by the passage of the current, proceeding from a powerful battery, between two points of the charcoal, pointed point to point. The charcoal being an imperfect conductor is rendered incandescent by the current, & being exposible to any temperature hitherto attained, the degree of splendour of which it incandescence is susceptible has no other practical limit except the power of the battery.

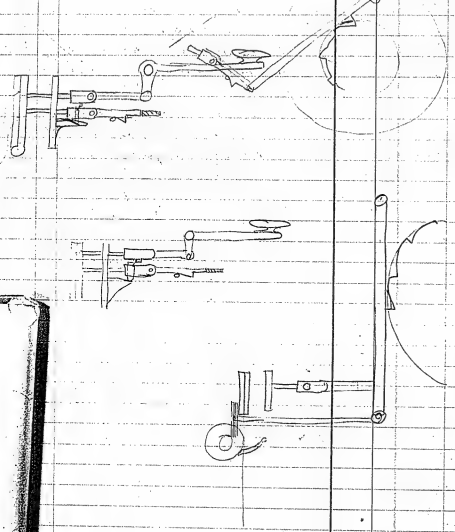


C

Automaw

~~Device for transmitting~~

Device for transmitting Strips for Automatic transmission for Stock Printer



Automaw

The strip of paper for transmission must be perforated by 2 punches one for printer lever & the other for escapement & as the unit work on open & closed circuit the strip must be perforated after the manner by the transmitter:

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z &

now if this strip is put on a drum & a roller pen running over it & connected with the escapement of a stock printer it will work the type wheel round, but now in order to print you have to have a perforating punch which punches a hole directly above (or directly below if on open circuit) the letter & introduce another roller pen in transmission connected with pty battery & magnet & so if you want to print BAD your perforated strip will look like this

Nov 18/73

1. See what effect a strong magnet has on
B. Copper, Nickel

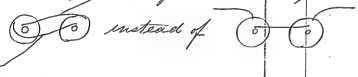
2. Make 2 magnetic needles thus:-
B. & & suspend one with a thread
& see what effect the other has on it.

3. Take a magnetic needle & place it on a cork in
B. a dish of water see if it points north.
Now put a current from a strong battery in it
& see what effect

4. Find out what this means: Magnetic attraction
B. & repulsions are inversely as the square of the distance.

5. See whether the pole of a gravity battery give off
B. hydrogen & oxygen or not

6. See how much resistance is lost in
B. connecting a magnet this way:

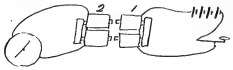


instead of

A current of electricity passing near a magnetic needle deflects it.

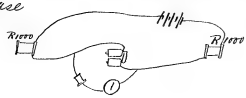
Yes

7 See how much induction there is from
B a magnet of a given size on another
the same size when they are touching
& different distances away.

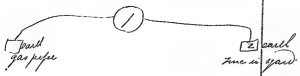


8 Shunt No 1 Magnet
B " No 2 "
" both a " & note induction

9 Examine well the back charge in this
B case



10 Connect a wire to Zinc ground in yard
B & gas pipe & see if you get a current
thus



11 Decompose Iodide of Potassium with electricity
B

11 5 cup Carbon
Hydrogen bubbles from neg. pole
Oxygen combines with K.O. & the Iodine is set
free settling to bottom in deep cloudy state colour
of Pot water.

Cur

12. Chemical paper.
B Hydrosulphuric Acid } Iron pen
Cyanuret of Pot.

13 Ferrid Sol.
B Hydrosulphuric Acid } Iron pen

14. Ferrid Sol.
B Hydrosulphret of Ammonia } Iron pen

15 B Antimoniate Potash } Iron pen.
Chloride Sodium

16 Antimoniate Pot.
B Chloride Sodium } Iron pen
1 drop. Hydro Sulph Acid

17 Get resistance of Iodine paper moved
C. 3rd a second & prevent Iodine from insulating the pen See if resistance decreases as battery increases.

18 Make Little Solution & try it
12 Water
4 Sol. Chl Cal.
C 2 Sat Sol Ferrocyanide Pot
Add Chromic acid till it assumes a cherry color.
Add to part Chl Sodium

Cur

White paper. deep black mark but fades out. not so sensitive as pen

Very light yellow paper. purple mark very broad. permanent.

White paper. Black mark turns brown permanent

White paper Brown mark pen.

12 & 13.

White paper Brown mark

Little solution is a failure. the worst we have ever thought of & got a mark pen in little kawit. It makes as good a mark almost without battery as with. It is a light yellow paper & blue mark with Iron pen but pen will not mark on platina plate & no other pen will mark in this solution. I can make as good mark with my finger nail as I can with pen. Tried it with excess of everything but it is a complete failure

Battery EN

19. Hydrosulphuret of Potash — Ten pen

20 b. Bichloride Mercury } Chloride Sodium } — Ten pen

21 b. Phosphate Soda } Chloride Sodium } — Iron pen

22. Nitric Acc.
b. Chlorate Pot.
Sulphocyanide Potassium

23. Make sawdust battery in a large battery
B. jar such as is used in Ex 1 Carbon
& note deflections

24. See if you can put a charge from Plate electric
into a steel needle magnetizing it point north
E. & see if the charge will make the point from
due north also see how near a substance
insulates or not will approach before
throwing it out of its track

23 Dec 29. 12 noon. 25 — 10 — 2 — 0
Dec 30 — 9 a.m. 43 — 27 — 5 — 1 — 21 K. Battery
Dec 31 — 9 a.m. 47 — 23 — 9 — 1 — 25° Batchelor
Jan 2 — 9 p.m. 49 — 22 — 25 — 3 — 14 50 K.
Jan 6 — 9 p.m. 50½ — 22 — 11 — 12 — 100°

Ext

Ans

25 See if by any arrangement you can prevent the needle of the Silvertown Galv.
E from sticking & the points perhaps welding the nibs, thus which the needle is suspended on will do it

26 Chromic & Permanganic Acids part with their O. with smallest current. It is a great object with sensitive paper to get the largest amount of O liberated from the
E weakest currents so as to get the most peroxide, therefore try Chromic & Permanganic acids with & without Chloride Iodines or other substances. If it should spontaneously decompose without current a little, but greater with, there would be a light continuous mark between dots & dashes but if you run fast (20 words) with sensitive paper the spontaneously made photo would not show.

Conductivity

27/ See if you can arrange inking pad
E. so that the embossed marks are more regular

28. Try conductivity of Mercury & Zinc
E. amalgam in small tube & see if it is high & constant

29. Try this:— See if the mere passage of the current from 2 or 3 good cells to one of Carbon bat through the Armature lever & plat. pts. will make them stick. I suspect that when the spring is adjusted so as to just pull the lever away from point when no current is on by pushing it up with finger it wont stick but if battery is connected & it is then pushed up it will stick owing to magnetic effect of current on plat. pts. Include a sounder in circuit

29. The stick is very perceptible on a cups carbon plating relay, is dim sounder, sticking not so great when you substitute resistance for sounder. Platinum is magnetic & tested it by the means I suspended a needle of soft iron by a fibre of silk over the points & every time I closed circuit it drew middle of platinum points.

Note. Platinum is not magnetic it is the current which passes through it.

30 You know that when Sulphuret Pot. is used with an iron pen, the pen becomes polarised thus: —

transmitted — — — On closing the
Recorded. — — — circuit there is an

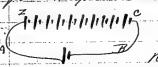
8 intense black mark on opening it comes on closing again the mark does not commence for some time. To get rid of this try a double pen iron & Platina thus:-

Also try copper, zinc Pen. with Iron!!

31 Put up 10 good Carbons & test each one on Pl. 4. Shadley to get deflection, pick out best one & try & get 9 others that equal it. Then connect these 10 5

8 a single cup giving the same deflection connecting the ends of 10 cup battery to the zinc of 1 cup & zinc of 1 cup. Take the deflection on 1.2.3 & of 10 separate & the 1 separate every few hours for 3 days. Keep them on closed circuit all time. Also take deflection all together I want to see what reaction will take place in single cell

31 Galvan. 27.. Electroporion 34 Beaumt.. 4% fluid of each



Date	Time	10 Cups 1	2	3	4	1 Cup 1	2	3	4	Resistance of Arth. Rod A 1	2	3	4	Resistance of Carbon 1	2	3	4	Resistance of Carbon 1 cup & zinc 1	2	3	4	Remarks
Jan 10 M		86	80	84	18	—	70	67	55	75	75	69	8	75	75	75	11	75	70	64	11	Jan 2. 10 A.M.
3	3 PM	165	83	66	17	—	72	72	54	65	65	65	8	67	67	67	14	67	65	60	14	Shook in 10
7th	7 PM	87	85	76	10	—	75	72	65	67	67	67	10	67	67	67	12	67	65	60	12	cup fail so all
8	12 PM	85	78	65	10	—	74	73	60	75	75	75	10	75	75	75	12	75	67	60	8	that which the
10	11 AM	77	75	57	12	—	73	70	60	65	65	65	11	65	65	65	3	65	60	60	8	Pl. on 1 cup
10	2 PM	78	76	60	12	—	72	72	60	67	67	67	11	67	67	67	11	67	60	60	11	seems as that
13	7 PM	77	70	61	10	—	72	72	50	65	60	65	14	5	71	65	14	60	60	55	5	a rock.
13	10 A	77	70	59	12	—	70	70	55	65	60	65	14	65	65	65	14	65	60	55	14	
21	9 PM	77	70	61	13	—	72	72	55	65	60	55	14	60	60	55	14	60	60	55	14	
27	7 AM	74	74	59	11	—	70	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
27	7 PM	74	74	59	11	—	70	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
28	5 PM	74	72	57	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
29	5 AM	74	72	57	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
29	5 PM	74	72	57	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
30	6 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
30	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
31	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
31	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
1	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
1	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
2	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
2	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
3	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
3	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
4	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
4	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
5	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
5	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
6	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
6	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
7	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
7	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
8	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
8	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
9	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
9	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
10	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
10	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
11	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
11	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
12	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
12	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
13	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
13	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
14	9 AM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	
14	7 PM	73	72	56	11	—	69	72	50	65	60	55	14	60	60	55	14	60	60	55	14	

Remarks: Jan 2. 10 A.M. Shook in 10 cup fail so all that which the Pl. on 1 cup seems as that a rock.

Pl. Electrode 110 A

Carbon 100 A

32 Connect 5 cups Carbon iron 5 more opposing each other (12) the carbon of 1 five connected with the carbon of the other five. Take deflection of each 5 separate then conjoined together & take deflection if there is any current see which battery gives it then change cups so as to get a balance with 1 to 2 degrees on No 4.

C.

33 Put 3 good cups all same deflection on No 4 separately on closed circuit in

C. cell deflection on all coils every few hours add 5 think how long a Carbon battery will last on short circuit.

34 Evaporate different metal solutions on clean Zinc (polished) by heat & note any specific colors for different metals

C.

Galvanometer 24. Line Leyden Berlin not. Applied to Electrophorus 24 Beaumé on each
Jan 1 - 9 AM Electrophorus looks as good as new, surface polished a little.
Remarks:-

	1	2	3	4	1	2	3	4
Dec 31	23	23	23	23	23	23	23	23
Jan 1 9 AM	18	18	18	18	18	18	18	18
12 Noon	18	18	18	18	18	18	18	18
8 PM	18	18	18	18	18	18	18	18
7 PM	19	19	19	19	19	19	19	19
12 Noon	20	20	20	20	20	20	20	20
7 PM	21	21	21	21	21	21	21	21
2 9 AM	21	21	21	21	21	21	21	21
7 PM	21	21	21	21	21	21	21	21
3 9 AM	21	21	21	21	21	21	21	21
7 PM	21	21	21	21	21	21	21	21
4 9 AM	21	21	21	21	21	21	21	21
7 PM	21	21	21	21	21	21	21	21
5 9 AM	21	21	21	21	21	21	21	21
7 PM	21	21	21	21	21	21	21	21
6 9 AM	21	21	21	21	21	21	21	21
7 PM	21	21	21	21	21	21	21	21
7 9 AM	21	21	21	21	21	21	21	21
7 PM	21	21	21	21	21	21	21	21
8 9 AM	21	21	21	21	21	21	21	21
7 PM	21	21	21	21	21	21	21	21
9 9 AM	21	21	21	21	21	21	21	21
7 PM	21	21	21	21	21	21	21	21
10 9 AM	21	21	21	21	21	21	21	21
7 PM	21	21	21	21	21	21	21	21
11 9 AM	21	21	21	21	21	21	21	21
7 PM	21	21	21	21	21	21	21	21
12 9 AM	21	21	21	21	21	21	21	21

In testing both batteries together I got a deflection of 5 degrees in favour of No 1 Not 2 battery a little more resistance.
Jan 2 - 7 PM In testing both batteries get deflection of 18°. had it run down to 18° in 2½ minutes
Jan 3 8 AM Deflection of both 7.25°. had run down desultory.
Jan 4 9 AM got deflection of 22° from 2 Trains & 38 Prim. Carbons had run down desultory.

Batchelor
Edison

Galvanometer 28. Remarks: Water outside cools cup perceptibly
Cup. Further are filled now & has water outside
+ The water which just covered Line is now 1 inch under it

	1	2	3	4	1	2	3	4	1	2	3	4	
Dec 31 9 AM	70	62	70	70	70	67	50	70	70	61	70	20	
6													
1 12 N	70	66	65	7	69	61	15	6	70	58	65	174	3
6 3 PM	70	55	70	70	70	62	70	20	70	61	70	20	6
Jan 1 9 AM	70	61	67	73	39	70	70	67	70	56	66	73	20
2 10 AM	73	70	66	11	70	70	70	10	70	70	70	11	97
2 PM	73	72	66	19	70	70	70	12	70	70	66	13	13
7 PM	73	73	67	3	70	70	66	2	70	70	66	1	PM
3 9 AM	73	73	67	3	70	70	66	2	70	70	66	1	71
7 PM	73	73	67	3	70	70	66	2	70	70	66	1	14
6 PM	73	73	67	3	70	70	66	2	70	70	66	1	71
4 9 AM	73	73	67	3	70	70	66	2	70	70	66	1	76
5 9 AM	73	73	67	3	70	70	66	2	70	70	66	1	122
6 5 PM	73	73	67	3	70	70	66	2	70	70	66	1	120
8 AM	73	73	67	3	70	70	66	2	70	70	66	1	102
6 PM	73	73	67	3	70	70	66	2	70	70	66	1	103
10 AM	73	73	67	3	70	70	66	2	70	70	66	1	102
6 PM	73	73	67	3	70	70	66	2	70	70	66	1	177
7 11 AM	73	73	67	3	70	70	66	2	70	70	66	1	
6 PM	73	73	67	3	70	70	66	2	70	70	66	1	
8 11 AM	73	73	67	3	70	70	66	2	70	70	66	1	
6 PM	73	73	67	3	70	70	66	2	70	70	66	1	
9 11 AM	73	73	67	3	70	70	66	2	70	70	66	1	
6 PM	73	73	67	3	70	70	66	2	70	70	66	1	
10 6 PM	73	73	67	3	70	70	66	2	70	70	66	1	
11 6 PM	73	73	67	3	70	70	66	2	70	70	66	1	
12 6 PM	73	73	67	3	70	70	66	2	70	70	66	1	

Batchelor
Edison

98. Induction:—
See if the extension of the cores by putting 2 inches iron cores pressing up against those of magnet will increase induction with out adding more wire

Also try this

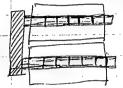
You can gear up those tables so that
E. transmitter will have to turn quite fast to get a moderate speed on recording, in changing from one experiment to another it would be best to keep transmitter going & the pressure of your pen adjusted always be alike probably this would answer

For this experiment use a whole circle of paper at once as at above. the paper all alike etc
Note the deflection of tab used on the 4 coil & always keep up to that deflec. Be sure you get bridge resistance correct so not the least current shows on paper even on turning slow. It takes a given amount of resistance to show current on record pen after you can see it on first it has

Pull out solid core & insert cores of 8 solid wires with regular back & armature see which gives most induction solid or 8 wires.

Edison
Patchin
Lowe
Jan 12 1878
14 hrs

36 Try this for induction & strength of attraction:



Core to be sawed in lengths of ½ in & separated by brass as the two halves touch but are too of an inch off. Have an idea that there will be no induction & attractive strength is as great as solid core w. iron or some rubber with same battery. If this is so we can make long ordinary magnet thereby getting strength & yet have no induction.

C

37 Wind one layer of German silver bare wire on a core of boxwood covered with one layer of soft paper, wind well good tension, after wound shellac & dry & then test resistance.

C

Test wire before winding of German silver lest to make each turn punk onto the paper & away from its neighbor.

38 Make solution of ¼ of Ferricyanide Pot. & ¼th Salt

C

Crystallize & see what difference.

This solution crystallizes at first in beautiful long deep crystals but on becoming dry & gets more to the nature of salt & is of a greenish yellow hue.

39 By diffusion of different substances between 2 platinum disks. In ascertaining it first place the solutions in glasses of the same sort so platinum disks shall fit each. Allow them to stand in a quiet place for 24 hr & note diffusion. The lighter liquid, (ether) or hydrocyanic acid must be put in first, & the heavier is poured into bottom of glass with glass tube very carefully to prevent mechanical diffusion, & mark to then made where the liquids join & a note made as to the sharpness of line etc. The glass is then covered with a piece of writing paper on which has been rubbed beeswax & pressed down on the rim. This will prevent evaporation.

E. At the end of 24 hours the substance which shows considerable diffusion is taken down & platinum disk placed in it so that the lower disk shall just come to mark previously made on the glass. This is connected to the battery, the lower to the Zinc plate & the upper to copper plate. Put aside & note the time. Be careful to bring back the two liquids to their original position & note all phenomena.

Make platina disks like this:-

Try:- Molasses & Chromic Acid
" & Chrome Yellow
" & Prussian Blue
Alcohol col. by Saffron &
Deep yellow saturated sol. of Sulphate Zinc

Sulphate Copper & Chl. Sodium col. Cay cochineal.
Protosulphate Iron & Carb. Pot. col.
Water & Lamp Black.
6. Glycerine & Turpentine.
Also immerse in 2 dense precipitates.
Reverse connections.

40 Arrange a test tube with 2 platinum strips & conduct H. Calland & test all metals in table 1 in Borax under electric influence & ascertain if the reactions are the same & also use very dilute solutions of metals to be detected & see if the presence of the electric current increases the delicacy also pass a spark constantly onto the solution from the plate glass machine

41. Substitute a magnesium plate in battery in place of zinc & note deflections.
6

42. When magnesium is put on water it liberates pure inodorous hydrogen. Hence associate a Magnesium pen with the iron pen in reg. Florid Sol. feel before & then after the non one & note the difference.
5

43. Mix a thick solution of Glue with Lunjitate of Soda & hydrochloric acid a compound of Lunjitic Acid & Glue is precipitated. At a temperature of 84° & 114° Fah. it is supposedly elastic & admit of being drawn into very thin sheets on cooling it becomes solid & brittle & on being heated is again soft & plastic. See if it will do for the Rubber.
13

44. Try this for a more sensitive mirror galvan. By this means we can get a great deal larger torsion.

Ammonia & Battery

46 Make Automatic Glue for Automatic

46 Make battery of sulphate of soda instead of Bichromate & take deflections.

47 Make a battery with plumbago in porous cup & Muriate of ammonia in jar & take deflections

Ant & Battery

45 18 Fluid oz water } dissolve in water bath.
10 oz Gum arabic } this is about enough for
1/2 oz Sugar } 10 pots. & costs about 6 pence pot.

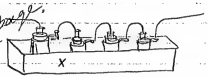
Tannin Co.

4 fluid oz water — 1/2 oz of sulphate soda
(1 1/2 Carbon cup.)

	1	2	3	4				
Aug 6 — 9 AM	50	41	12	5				
— 6 PM	40	13	4	2				
7 — 9 AM	27	23	12	2				
6 PM	15	15	9	1				

Used to in Carbon cell (No 90) which it seemed to be sealed in porous cup.

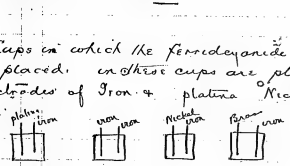
See next page.



X is a trough water tight made so by paraffine in this trough is set 5 zincs with porous cups and Carbons, in the porous cells is the Red Ordinary fluid in the trough is acidulated Water. Take the deflections of these 5 Cups through 5000 ohms, Then take 5 regular Cups and take the deflection through same Resis with Bradley No 1. The object being to ascertain of the seperation of Each Element in Operant Outside Solutions is absolutely necessary — Try on No 1 2 3 & 4. Bolly

—

Cups in which the ferrocyanide Regular solution is placed. in these cups are plunged small electrodes of Iron & platina Nickel Brass & Iron.



Connect to Gal No 1 2 3 & 4 get deflections on each cup, have all plates as near same size and distance apart as possible If no deflection on Bradley try Mirror The object being to ascertain of the Iron recording pen in Conjunction with the wet paper and drum of Nickel or other metal forms a cell and generate a Current. If it does it may have sufficient Electromotive force to neutralize a very feeble Current which is sometimes met in Experimenting

Get the deflection of 4 cups Calland used for Local on Washin Cons through 5000 3000 1000 & 500 ohms. then on No 1 2 3 & 4 Cells —

Then take 2 cups Carbon and take the deflection through same resistance and see if the 2 Carbon dont equal the Calland 4 Cups. in the proportion of

100 units for Carbon
56. for Calland.

New Carbon (4)

If 3 cups Carbon are necessary take new set deflections

Then try 1 Carbon Cup on No 1 2 3 4 & Especially.

Then Connect the four Calland for quantity ie all the Zincs together and all the Coppers together and take deflections on 1 2 3 4 ohms Galvanometer —

Select the Carbon Cup out of several as the one which gives the highest deflection on No 4.

12 hours.

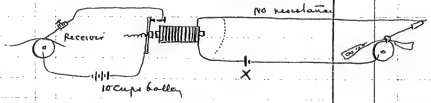
Jan 23 Bradley galvan. 28 Three were kept in 21.10 Ohms resistance but not taken on ~~5000~~ Ohms resistance 28

	4 Cups Battery				Wood box with 4 Lines			
Jan 23	1	2	3	4	1	2	3	4
2PM	21	5	2	0	23	6	1	0
Jan 24	21	5	1	0 12N	14	46	1	14
	89	82	81	51 5PM	89	88	86	63
Jan 25	83	81	81	51 10AM	82	81	81	45

Analyze that red looking stuff that gathers on Copland battery.
Tonopaet Iron & Lead.

Also test some of our Zinc used for battery for the several Metals.

Ascertain the greatest number of perfect dots that can be recorded on Chemical paper from the repeating point of our large relay Tillotson pattern. Thus



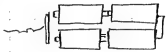
Try with 1 Carbon Cell at X. Then 2 then 4 — 8 — 16 — 32 —
The armature being $\frac{1}{16}$ from Cores, Then Repeat with it $\frac{1}{64}$ — then repeat with it at $\frac{1}{8}$ then $\frac{1}{4}$ —

After these Experiments which should be performed with a Coulomb line of dots and accurate timing not less than 10 Seconds, Shunt the relay with twice its own Resistance, the relay ought to be 200 ohms but 100 will do, Then go all over it, be sure on making the first trial to adjust the spring a number of times before pronouncing that on the highest speed possible —
When you try this Experiment I want to audit —

See page 163.

Then Substitute for Tillotson the Phelps and add outside Resistance so as to Equalize R of the former relay & Duplicate all the Experiments.
Then try one relay with shunt off & Duplicate all the Experiments

Then Screw two Tillotson spools together thus



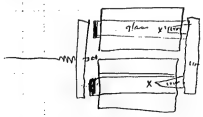
and use as a long relay and Duplicate all Experiments,

Then try one of these little short relays on brass base —

Then Try a Duplex Sounder in place of relay

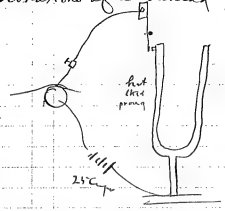
Get a pane of glass wipe perfectly dry and paste two strips tin foil on each end Connect one to Each other to plate glass Machine, use some highly colored spray between the foils and pass the Current through notice if the particles of spray seperate from Each other also pass the 1.75 small cup through a thin film of colored water from foil to foil see if it dont seperate the moisture in two parts until no Current passes

Make an electromagnet the cores of which are glass tubes filled & packed tight with fine Iron (no steel) filing and an Iron back & Iron armature. Close the front ends with sealing wax. Try attraction force & Induction.



points x' x fastened to back and extend in among the filings to form a Magnetic Connection.

To record on Chemical paper the vibrations of a tuning fork thus



To insulate Copper wire for magnets by forming an insoluble oxide on it –

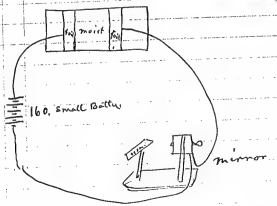
Try this:

Immerse a loosely coiled hank of Copper in a jar containing air inverted over a jar of water into this under water Convey oxygen gas by a tube for few seconds, (clean the Copper first). This will oxidize the Copper then gently & carefully withdraw the Copper wire and immerse for an instant in a solution of ~~ferrous~~ ferricdoxanide of pot. 1 oz to quart water, this will convert the oxide of Copper into the insoluble ferricdoxanide of Copper and perhaps prussiate insoluble & stick to the wire,

Take two brightly highly polished pieces 4 inch long of no. 9. iron wire, boil one for 1 hour in oil, do nothing with the other – Now put both in a bottle water separate from each other – leave the bottle ~~open~~ open to allow free access of air & set up on high shelf – for several months. I think the oil will prevent one of the wires from rusting.

Jun 28 1874 ~~These two pieces of iron wire were put in a battery jar the one that is cut with a file and this was boiled in lard oil for 1 hour~~

March 31 2 pieces of Washburn wire highly polished the one with 3 rings on end has been boiled in lard oil for 1 hour
2 ~~shorter~~ pieces of 9 wire with the galvanized part filed off 1 with 1 mark on & 1 with 2 marks on the one with 2 marks has been boiled in oil



Moisten glass between foil & take deflection
Even 3 minutes =

Ascertain what is resistance of Toms Body also your own & Brouns with dripping wet hands
See if the deflection is constant for 5 minutes.

Aluminum Pen.
Aluminum Salts have a great affinity for Coloring Matter, forming insoluable pegments

Perhaps a protoxide will be formed in the Electrolysis then if the pepe Contains a fleeting Color from an organic substance or Otherwise and the Prote Combines with it to form an insoluable Color while the Color not under Electrolysis fades

Aluminum Salts have a great affinity for Gelatin perhaps a Gelatinized

4 Cups Carbon.
Jan 21st Zero 19.570 ohms
Baked 16.900
Finish 16.070

paper might be used and insoluble
Marks (raised) be ~~made~~ produced

Alum changes the Tints of blue petals
of plants to Green
hence the paper be wet with a stable
infusion of some Blue Color. (say red Cabbage
although that aint Blue) or Logwood) on
passing the Current a photo would be
formed & change the blue to Green &
perhaps some Chemical having
no action of the Vegetable Color
would be included in the Solution
which Chemical would increase the
Oxidation or perhaps produce an
exciting action & turn the lower
oxide into a higher or form an
Alum or aluminum Salt

Try for Patent purposes

Ferroprussiate Chl Calcium & Sulphuric or
Nitric Muriatic Acids to free the Chlorine
from the Calcium & produce a ferrid

also - Ferroprussiate. Chl Lime & acids
" " " " all Chlorides & acids named
Chlorates also.

prepare some Cochineal as given in Dicks —
(test for prolosalt iron) & add some Chloride &
test for delicacy

Patent
Ferroprussiate Chlorinated Lime & slight
amount of Sulphuric Acid, (Muriatic) or Nitric Acid. (yellowish-Sea)
Hydrochloric Acid (Muriatic-Sea) Acetic Acid (yellow)

Ferro-cyanide strong. strong Sol Chl. Calcium
Little Chl Acd - Sol acid until it turns
paper yellow - Little turns it blue - very
sensitive probably greater than ferrid.
Excess of Sulph Ac. on good.

Nickelpen gives brown mark with excess
of ferrid & Chl Sodium nearly as good as Iron

Strong Sol. Chl. Calcium & little Nitro Muriatic Ac. (left the good mark.

1.77	=	8/1
9.4	=	4/1
.6	=	2/1
0 3.1	=	1

Paper
1 ounce Drachms Dilute Sulphuric Acid,
5 Grains Permanganate Potash.
Will probably give a white Mark.

Paper 1 oz Sul Soda. 6 pennyw. Sul Acid
6 pennyW Sul Copper Boil.
try – if unsatisfactory add a chloride
also to fresh part add Nitrate Amon

Try Little perchl Iron & Cyanide Potassium
to this add 50 different solutions the
Grand Acids.
The Sul Acid will probably free the
Chlorine from the perchloride Iron
The iron going over to the cyanide to
form ferrocyanide the Chlorine acting
on this forms a ferrid & we obtain a
Sensitive paper perhaps peroxide iron
or Sesqui or even Sul Iron will answer

Try Nitroprusside Sodium – & Salt

Try Nitroprusside Sodium & Chl Sod &
Sul Acid, The Nitropru having a
ferro in it Sul Acid action on Chl
Sod Calcium etc will produce a ferrid

With this white mark not very permanent
obtained with nickel Copper Iron Bismuth
pens probably will prep perchlor good
Paper be obtained, paper Colored internally
Tannated Color (red) also Blue by Cy
Sul Iron – get no mark –

Cyanide Pot & Per Chl Iron from Blue paper

Dont work – strikes good with peroxide only

Test starch with Tannin, etc as deliquent as Iodine - Dick pr 4381

Poison Mushroom Solution - Iron Oxide good yellow - also other metal characteristic Colors accordingly.

Aluminum pen Colored paper
Borax & Aqua Ammon White mark

Zinc pen (acetate of zinc well) Acetic Acid. Blood.
Red Mark in Solution as dilute Blood imperceptible

Lead pen - Sulphuret Lime 2 drachm 2 drachms
Tartaric Acid powder mix & shake in a stoppered
Bottle, with pure water let settle pour off
Clear Liquid & add 1½ oz Tartaric Acid
Black mark - if no mark add little wine
Sherry - 4402 Try 4403

Hematin from Logwood - Copper pen
Chloride. Violet Blue Black
In a fresh part add Acetic Ac.

Solution of Sulph. Manganese
Platinum pen
High tension Bat.
Also Electrical Mac
Ozone: gives black varnish.

Hydrocyanic Ac Iron pen
Sulphuric Ac

Cyanide of Potassium
Sulphuric Ac
Iron Pen.

Mix Gum Arabic 125 parts concentrated
Sulphate Alumina 2 parts.
The proportion of Gum Arabic is 2 of Gum
to 5 of water.
The sulphate of Alumina is to be dissolved in
10 times its weight water & mixed direct
with gum solution.
Called Vegetable Glue.

E.A.M. 15th

Test for Sensitive paper. Through 10.0000 hm.

1. Original ferric Solution. 1 gall H.O. 7 oz. Fe. 1 oz. Ox.
2. Sodide of Potassium Sol. 1 gall H.O.
   2 lb. Iodine Stown. 1 oz. Starch.
3. Infusion Logwood, Sulphey Pot. Salt. —
   " " Potassium. Pot. Salt. —
4/5. Decoction Logwood.
6. " " & Salt.
7. " " " " & Sulph Ac.
8. " " " " & Acetic Ac.
9. " " " " " " " more Logwood
10. " " Salt, Acetic Ac, Chl. Iron.

with 1 cup carbon
1. Faint blue mark. (perm.) Iron Pen
2. Faint reddish brown mark. (fades of course.) Platina Pen
3. No mark with any pen. white paper
4. Dark red paper, no mark.
5. Dark brown paper, black mark with Iron pen & deep brown with copper. both permanent.
6. ditto but not so sensitive
7. No mark.
8. Brown paper, ten pen, red mark rather sens.
9. More sensitive the marks are stronger. & stronger than in middle thus — — — —
10. Iron pen, deep purple mark, dark purple paper.

E.H.M. 12

Guaiacum test for ozone.
Dr. Dobert of N.Y. states that strips of paper saturated with tincture of guaiacum afford a more sensitive & certain reagent or test for presence of ozone than either K I & starch or paper containing protoxide of thallium & that such an ozonometer can be relied on & show at least 10 gradations or shades

Iodide of Potassium solution
Bismuth pen shows give brown mark
Paladium pen " " black mark
perhaps these are permanent & sensitive

See how many cups of Bailey it takes & mark on Filter paper dry perfectly

Make Pouget-Maisonneuve' Solution
150 parts Cryst. Nitrate Ammonia
5 " Ferro Cyan Pot.
10 " Water
Before using, paper must be moistened with dilute Sulph ac. superficially, strong for conduction but not & attack metal

Guiacum dissolved by Aqua Ammonia: no waste.
Very poor mark with platina only on platina better on iron — add salt, increases delicacy much
gives blue mark with Copp which is not fast
but rapidly turns blue on mixt. Iron gives on platina
Deep red or rust Colour & on iron better mark
quite delicate something in it. Copp first light
Color turn green mark opens slightly
Coke & gen: Zinc & pen no good

The grooved wheel which Bergman
claimed in Universal printer was
in Buquet's Electro Magnetic dial
about (1845.)

Mark Bonelli's Solution:
Nitrate of Manganese
a light brown colored precipitate.

Paris — wires are run in Lead tubes & hung along the Sewers. Some of tubes have only 3 wires. 6 to 8 miles to get out of City.

Prussia uses Regular Submarine Cable to run off of City
Several wires each Cable, 6 miles out. Poles, —
Cross arm wires etc nearly like American, Porcelain

French Pole wires closer as in England. No Cross arm.

France: Poles & Relay. No Prussia.
Closed Circuits need a little in Prussia.

Prussia Likely to take Automatic.

Feby 5 1874

Manganese & Magnesium decompose water at the boiling point, but will not do it cold (ie) the affinity of O for H, is greater when cold than O for Manganese or Magnesium, but the affinity of O for H is lessened by heat & O for Mn & Mg correspondingly increased.

Other metals will decompose water at red heat lowest is Zinc then Iron Chr Co Ni Sn Sp Al Pb Cu last Noble which show no tendency to oxidize in air are incapable of removing O from H & O hence magnesium & Manganese pens. (Mem use hat rolls of reg forced) A fine state of division favors Chemical action hence Called round Box Zinc or paper or Gutta box filled with a Zinc & packed granulated Zinc & Copper box filled with Copper wire scraps. Get a porous pot about ½ inch thick to fit 1½ Carbon balls Zinc & Carbon to try length time will last. & to prevent the Chemical diffusion of Bichromate from the Carbon pole where it is needed. must to give up an atom of O to the H_2 set free. if Phosphorus exposed in a lump to air dont oxidize so quick but dissolve it in a little Bisulphide of Carbon pour on a paper instantly all oxidizes being in a state of fine division hence I dont believe can prevent form decomposing pen Iron with ferrid ultizis all the O produced owing H it being in one mass, hence make a pen 6" diameter Composed of a large number of No 40 hard drawn wire.

Aug 5. 1874

Get some peroxide of Hydrogen H_2O_2
Sold by Photographic Chemists

See Blox p. 84 — 85 —

Dissolve ferrid in it in place of H_2O_2

Ether & Essential Oil. will decomp Iodide
& Starch. Go for Guaiacum Blox 87.
Look at 87. Note = Blood.

Filter Logwood boiling water solution,
through filter having powdered Charcoal
This will decolorize it See if uncolored
residue has Logwood properties
Bone Black is more powerful

Galvanic means of preparing Barium
Blox 308.
Make Calcium

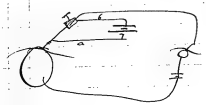
Cerium from Prolox amalt. Fe
forms Red Compounds Blox 32, — 6,

Sol of permang Pot is decomp by a
ferrous salt there red paper made
White by prot. Blox 360.
Good — Many like iron prolox
immense Coloring powers Many per
prolox mang — Chl Col in
paper forms xtrody differ black

Feby 5 1874

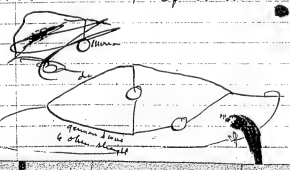
percip. — Blox 358.

Pure Sal Brm + Tannic A. may be mixed without Color but on exposure to the air the prots of Che Sul is deoxidized + the tannic Comb forms blk percip hence mix first — plat pen free alon of O. from pen deoxidizes prots + produces the Effect =



a b current in which is powerful quantity battery. to test iron decomposition by the current passing through it, this will increase sensitiveness, as chemical action are powerfully increased by heat =

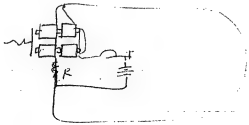
1. Try Induction from a Coreless Bradley Spool of 500 or 600 ohms + then downward to 1 ohm in bridge with Mirror



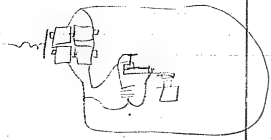
Feby 5 1874

Try Carbon Cup on a secondy battery of Clean zinc plate both same size. Opening no Element but with Mirror also

New Duplex Try it for book



also



Opens turns black sulph lead into white sulph lead.
Black sulph lead platinum per white matt

New Duplex all right O.K.

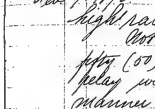
* The sentence we took was "Now is the winter of our discontent made glorious summer by the son of York & all the clouds that lowered upon" with this we got 250 words per minute but counting letters & a word we got 225.

1874 See page 130

Bully Experiment by S. A. Gibson assisted by Chas. Bunnell 12 yr.

Feb. 9 1873 Experiment tried on repeating at high rates of speed by S. A. Gibson Newport R.I.

Not being able to repeat more than fifty (50) words per minute through an ordinary relay we constructed one after the following manner:



A is (12) twelve ohm magnet.
B is a (200) two hundred magnet
C is shunt round B.
D armature lever & repeat points.

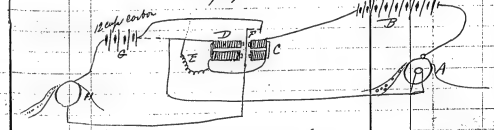
Wedge away with spring.

When you close key the magnet A charges instantaneously, but countercurrent from B prevents it from charging instantaneously & when you open the inductation current from B works round the shunt C & prevents the bad effects of B going on line.

The resistance in shunt C should be so regulated that the armature will stay on either side in pattern that when the line is kept closed the magnetism is equal on both sides.

With this relay we were enabled to repeat & record on chemically prepared paper at the rate of 250 words per minute perfectly; if the armature & repeating lever had been lighter we could have no doubt have doubled the above amount.

* The connection of app. :—

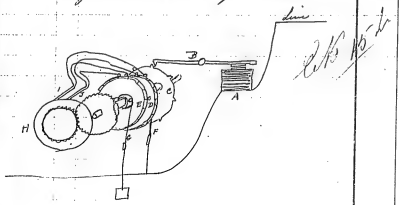


In our experiments the shunt E varied from 10 - 80 ohms.

We found that our rollers at A wiped very quickly so much so that at that speed they would have to be cleaned every few thousand words, which is a defect which we must remedy

1 Wire Roman letter Telegraph. Experiments by T. A. Edison assisted by Chas Batchelor.

Feb. 9. 1874. Having built a machine on the principle set forth by Edison for this extraordinary feat. We proceeded this night to test its qualities.



2 wire Roman Letters

Feb. 10th 1874. Experiment by T. A. Edison as by Chas Batchelor
The work to be done was to produce Roman letters using only 2 wires.
The principle of this experiment is to make & break connection 8 or 10 times in the length of a dot on each line & never let them both make connection at the same time.
For the purpose we constructed a machine like this. Fig 1

A B C D are four breakwheels with 60 teeth each

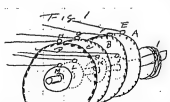
E F G H are breakwheel contact rollers

I is driving pulley

J K L M are the hubs of breakwheels on which also run contact rollers

This was run from the large grooved wheel of the four automatic tables.

Fig 1



We used of course reversed currents which only gives us four pens. Our perforations were made from a perforator that was made for 5 wire & consequently is made 5 dots deep thus

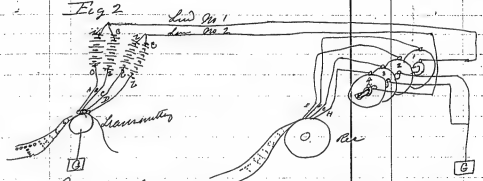
Now as we can only use four pens & having no other perforator we were obliged to use three perforations & cut one line of dots which we did thus.

cutting out the fourth line thus made our letters come thus.

MY BOSTON

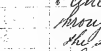
The breakwheel in fig 1 have got to be set so that the contact rollers E F should not make connection at the same time as the roller G H. The connection for the whole experiment are shown in Fig 2.

Fig 2



As will be seen by Fig 2 of I close on my pen B at transmitting end it sends a positive current to line No 1 which enters breakwheel No 1 at the hub passing through contact roller E pass through spring E & pen spring E & spring F where it makes its mark. If I lift off I close on A at transmitting it sends a negative current & one & positive to ground which comes up through Breakwheel 2 & marks on E pen etc. The same thing is done on line No 2.

The pens at transmitting end are set one ahead of the other on both lines thus as



that one pens is out of a hole when the other is in on each line. The pens at receiving end have to be set the same.

If we run at a high speed say 500 & 600 words we do not get all distinct dots are dropped & others put in owing I think to the 2 rapid reversal of current.

But up to 200 words or under it is all that we could wish the letters all coming out perfect, samples of which can be seen in scrap book No

For Roman letter Chemical Telegraph

Feb 11. 1874 | Experiment by T A Edison acc. by Chas Batchelor

In our last experiment with the subject we noticed that we could gain higher rates of speed if we could do away with such quick reversals of current

The present experiment is for that purpose. In this experiment we use reversals but they are of longer duration.

The impressions must be made a little more apart than the length of widest letter.

They the 3rd + 4th pen must be set the width of the largest letter behind the others 1st + 2nd

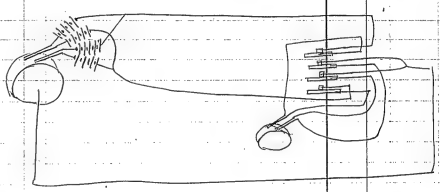
Thus

As will be seen the principle of the thing is to send a positive current from 3 + 4 to line not + 2 (Page 167) + record it on the 3+4 pens for receiving + after they have got across the letter the pens ~~the same the~~ 1 + 2 record their part of letter in same manner.

We can get better results at a higher rate of speed with this, but it necessitates a synchronism, for if the magnetting is sent faster than the receiving the writing will be like this. the top half ahead of the bottom

+ if transmitting too slow it will be the other way bottom line ahead of top

Very little practice however will enable a person + keep the letter always straight at the receiving end



Feb 17. Make a secondary battery of one of the large blue vitriol battery jars & sheet copper thus

2 parallel sheets of copper coiled together about ¼ inch apart & may be separated with small pieces of wood exactly 3 inches & then securely bound together with strong marline so that two plates cannot possibly touch even with rough handling. I want to ascertain the amount of charge & discharge this will show on a bridge as well as the length of discharge of satisfactory make 500 volts to be sent down the line I expect if these bat are placed on the line 20 miles apart that they will generate from the addition of the accumulator battery as much counter charge as that due to the line that being the case the static charge of the line will be exactly compensated for & any speed or any length of circuit may be obtained

Battery 1 10.00
Lost 10. 1 N

Make a coil of that gutta percha wire (small) with perfectly insulated joints & coil it on a magnet (1c) two large relay coils so that it will take up the heavy bulk as if Bradley & Porter were used again & placed in the circuit of a battery the current of which passes through the gutta percha wire

Also Wind outside of a Bichromate battery jar with 5 or 6 layers of ordinary relay wire & watch to see if when I close the circuit of the battery there will be induction in the wire

Try this

Comparing the electromotive force of 2 elements:

2 elements are connected in same circ. with a ten. galv., 1st so that their currents go in same direction & 2nd in contrary direction.

Let

Electromotive force be $= E \quad E'$

the R of elements $R \quad R'$

Interposed resistance r

Deflections of sum & indef. is $I_s \quad I_d$

Then

$$I_s = \frac{E+E'}{R+R'+r}$$

$$I_d = \frac{E-E'}{R+R'+r}$$

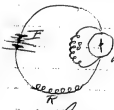
Whence $E' = E \cdot \frac{I_s - I_d}{I_s + I_d}$

Try small condensers of alternate sheets of:—

Copper + tinfoil

Tinfoil + tinfoil

To measure a large EMF with a small one:— use a shunt.



~~Battery E — unit.~~

Find resistance of Bat 1 + 2.

Find R of galvanometer

Take deflection through about 50 ohm

Insert Battery 2 & change shunt till means deflects to same degrees.

When the equal intensities in galv. are

$$f(\phi) = \frac{E}{(R+r)\left(1+\frac{g}{s}\right)} + g.$$

& $$f(\phi) = \frac{E}{(R+r')\left(1+\frac{g}{s'}\right)} + g.$$

from which

$$E' = E\,\frac{(R+r)\left(1+\frac{g}{s}\right)+g}{(R+r')\left(1+\frac{g}{s'}\right)+g}.$$

Large battery E' compared with small one E, shunt is only used in case of the large one & $s = s'$ may be inserted in above. by which

$$E' = E\,\frac{R+r+g}{(R+r)\left(1+\frac{g}{s}\right)+g}$$

Try this.

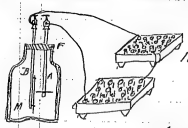
Test resistance of paper strip punched full of dots at all speeds.

Try Electromotive force in Pope 151 page

Charge an insulated secondary battery by with the 8 Bottles by connecting the prime conductor of electrical machine to one end of battery & other prime conductor to other end. Turn for 5 minutes then with insulated key throw battery on an insulated Bradley galvan.

Feb 22 1871

To determine whether any electricity pass from one pole of a battery of 100 elements to the other when separated a slight distance.

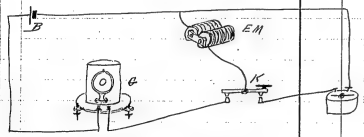


100 cells Porcelain cup battery

M is a clean dry candy jar F is a tight fitting vulcanite or rubber top well secured in jar with plenty of beeswax so that not the slightest trace of air in or out A B are 2 brass rods B has 4 metallic projecting pins in which is secured a strip of chemical paper 2 inches long moistened

with KI & starch (gram starch 20g
distilled water ℥5 Iodide Pot.)
A is another pot having a platina wire
& facing the Iodized depole carrying
wedge exactly to fan incs. from it
these two rods project out of the bottle
& end in binding posts. The rods should
be as far apart as possible. They are
connected with 3 trays of the test battery
& placed on a table. The tint of any
should be noticed & timed as well as
the time when the battery is first connected
the first tint should be noted & the time
taken when it shall have assumed a
depth equal to the first tint on the chromatic
scale shown in this work on Ozone.
Should there be a tint it will prove
first that the particles of air are
conductors for dynamic & voltaic
electricity of low tension & corollary
that induction is the effect of conduction
the fleeting effect being only produced
polarization (ie) an opposing EMF
Secondly that KI or any other
chemical compound that is decomposible
by electricity are very unreliable tests for
Ozone. et

Feb 21, 1874. Important motion or beat the present theories. Thusly:—

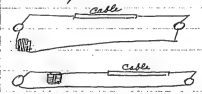


B is a single Daniel cell.
G is a mirror Galvanometer
K is a key with double contact points.
EM is a long electromagnet
GB a Bradley galvanometer in DA 1 coil

Press key down & wait for 5 or 10 seconds then open & close as quick as possible.
If the mirror doesn't move perceptably & GB does then smash your modern theories.
The magnet must be quite long & lots of fine wire on it otherwise yr. wire will not be able to work the key quick enough to produce the mirror working, the armature in EM should be permanently fixed so as to increase the induction effect.

Feb 22 1874

Note difference in these two:



first when magnet is placed between instrument & ground & then when it is placed between instrument & cable.

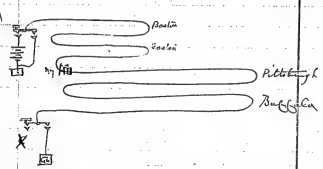
Galvanometer tests on Page 44
Electrical tables & formulas
must this & thoroughly understand it

Wed 13th 1874 Cable.

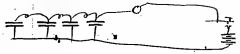
Experiments on Addisons theory of secondary battery action:—
under the following cond
Distance of scale from Mirror Gal. 22 inches
Resistance of Gals. 2100 ohms
" " Shunt 113 ohms
Lenght of Cable
Battery 105 small cups.
Resistance of battery
Cell mishl
RATO 12 ohm

Cable

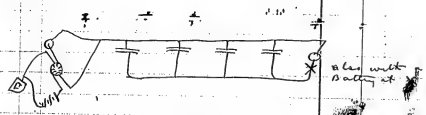
At Western Union.



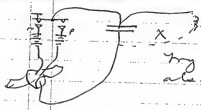
See if Relay closes immediately – whether it closes back with Key open at X to Earth or insulator.



Stop see if there is Enough induction to record from my from Condensers



Put battery on to have & then throw off. Recording instrument

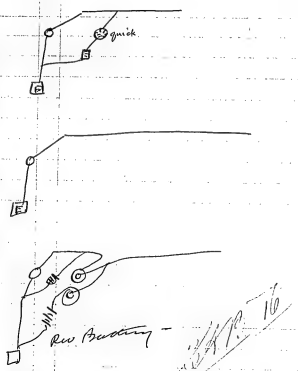


Try what it records. also with X Ckt & Resistance

If Resist Current on Cable but keep it on one instrument – probable that closing distant end will make recorder record which would not if open

Try

also replace magnet at X by placing Resistance


Quick
B
E
E
Rw Bending -
16

Gum Guiac & Aqua Ammonia Water
Chl Sodium Ferro cyan de Pot
Platina for blue - delicate
Not very permanent

Gum Guiac - H_2O Aqua Ammonia
Copper for Blue - Good
Platina for fair blue

Gum Guiac H_2O - Chl Sodium Boiled
Magnesium for Black mark fair
probable very delicate

Gum Guiac H_2O Ammonia Nit
Potash Copper & Nickel Blue
first class - platina = both the
Chl Sod - good but slightly
~~water~~ flakes - magnesium no
good Iron light Brown - no good

Gum Guiac H_2O Aqua Ammonia
Chl Sod & Nit Pot together nickel best
good - April 4 all blown
1874 — Elisha

Edisons Force.

Lead pen Iron base
1 D.K. Good. — 1
2 Ferridcyanide Pot. — 1¼
Bi Tartrate Potash = 2.
Sulphate Potash = 3
Permanganate Potash = 3¼
Acid Potassium Tartrate = 3
Nitrate Potash = 3½
Bromide Potassium = 3½
Ferrocyanide Potassium = 2¼
Sulphate Iron — ½
Ammonia Citrate of Iron — ¼
Sulphuret Potash ½
Sulphide of Manganese — ¼
Sulphide of Lead = 3
Boracic Acid = 1
Salt: Chl. Sodium. — 3½
Sulphuric Acid ○
Caustic Potash 3¾
Caustic Pot. + Com. 2½
HO

Ed B. 22 Vs
Apl 21 1884

Apl 21 Night. Tried metals as to which was best for testing new face
Platina on Platina
Lead on Platina
Lead on Iron
The base apparently is indifferent as to which metal is used
In testing with carbon & rubber we found that the carbon ~~pencil & the~~ very little friction at first when line was closed but soon it became very rough which quickly smoothed down as line opened
The reverse of this is the case when zinc is & metallic pad.

With 3 thickness of paper on drum it is if anything a little better.

Tried Blue vitriol & Bichromate crystals. Glass & hard rubber to make it go better by going through it but no go.

Heated metallic rubber no go.

Just got written through 2 ordinary Waist Rheostats 1 large ditto & 1 small ditto with 13 cup Carbon bat.

Minor gals. gave defec to throw sum shunted well 200 ohms (Bradley mx)

200 ohm relay ceased to work when 1 of the rheostats was out about 1 inch

Phelps relay 126 ohms repaired at about 2 out of 1. Rheostat.

Tried wet leather on drum (No good)
" H^d Rubber & Cloth. " "
" Co Wood. " "
" Indiarubber " "
" Phosphoric Ac. " "
" Board (" ")
" G^rS paper & Shoddy. " "
" Dry paper " "
" Brown paper " "
" Brown cup " "
" Flour paper " "

May 15 Tests for sensitive solution for tellurium paper experiment on Cable to of Atlantic
Orig Ferric solution poor takes greatly.
Cyanide Pot found to be pretty sensitive as we used it mixed with the following.
Cyan Pot. Acetate of Manganese. No good.
" " Sugar No good —
" " Cit. Citrate Manganese pretty fair
" " " & Salt good ×
" " Citric Acid. slight mark
" " Phosphor Molybdic Acid. very good +
" " Chromic Acid — no good.
" " Sulph Am. Sal. very good. ×
" " Arsenic Ac slight mark.

May 15/74 Hydrated lime seems to be the best solution so far for cables. Tellurium paper

Calling Hydrated lime	180
" " & Chl. Sodium	110.
" " Ammonia	120
" " Flour & Sugar	80
" " White of Egg	90
" " Amm. & Calf Amm	120
" " Sulphuric Pot & Salt	50
" " Ammonia Cyan Pot & Chl Sodium Ans. solution Marks on both sides	125
" " Lodide Amm.	

Lett^s 14 K.

May 16. Delicate solutions in Cable
~~Table Condensers.~~
Table Iodide of Potassium out — 100.
Sulphocyanide Pot. Salt,
Hyarate Lime & Ammonia } 105.

Decoction Logwood.

½ inch in each bottle. Table spoon of chem.

Nitrate Potash O = St. and Nick. 10000 ohms cells very sensitive. Tin [illegible] & Nick about equal the Fe not so much come out in air — with Salt. Tin increases delicacy Nick decreased — = Hydrogen — Platina fair — Tin — other inferior — salt in

Pyrogallic Acid — Nickel on O. only.
" Salt. — most all pens
mark on H. Tin slightly on O. best on H. Platina
marks on H. Tellurium best. Plat. as good as
Tin —

Citric Acid — None on H or O.
" & Salt — None —

No good marks without battery —

Chloride Mercury. Nickel good on O.
" Copper good on H.
" Salt Tin very sensitive purple —

Acetate Lead — Not good —

Carbonate Pot — Not good — on H. Tin slips
very easy when current on & hard when off.
may be good for chem. anter friction.
Salt no good —

Benzoic A. H. Platina with Salt — O. Tin
with Salt fair. No good without Salt.

"O"

Sulphocyanide K. Aluminum & Platina white
mark iron fade. very sensitive. Iron pen
blue mark pen. Comes out in air —
H. no good — Salt "O" Don't improve any

Sulphate of Potassium H platina sensitive
Tellurium exceedingly sensitive
all others pens mark quite sensitive
O. platina bleaches
Tin marks
Tellurium bleaches
Aluminum bleaches
Salt added Zinc very sensitive O.
Copper marks comes out in
sodponic acid O
Platina sensitive H
Zinc very sensitive H
Tellurium very sensitive H no marks

Hyposulphite of Sodium
H. Platina very sensitive
Zinc Muddling sensitive
Tellurium exceedingly "
Copper sensitive
Silver "
Iron "
O. No pen marks

Salt added
H Plat. quite sens
Zinc middle "
Tellurium very "
Iron middle "
Lead " "
Zinc " "
all pens marks
O Nothing marks

Dilute Nitric Acid
O Nothing marks.
H Nothing marks.

Salt added
No good.

Sulphate of Copper.
H Zinc quite sensitive marks appear without
O Zinc slightly sensitive

Nitrate Strontia (see next page)
O Platina marks White sensitive
O Zinc sensitive purple mark
H Platina black mark not sensitive
H Zinc not very sensitive
H Lead not " "
H Copper, Iron, " " Tellurium sensitive

Sodic Phosphate
H No pen marks
O No pen marks.

Salt added.
O No pen marks.
H No pen marks

Nitrate Strontia with salt.
O Zinc middling sensitive
H Cadmium " "
H Lead " "
H Iron " "
H Nickel " "
H Platina sensitive
H Zinc middling sensitive
H Tellurium very sensitive

Sulphate of Copper with salt
H No pen marks
O Cadmium not very sensitive.

Sulphate Sodium
H Platina middling sensitive
Zinc " " "
O Nothing

Salt added H Platina middling
H. Iron "
O No pen marks.

Acetate Sodium.
O. No pen marks
H " " "
Salt added
O & H No pen marks

Bichromate of Potash.
O No pen marks
H " " "
Salt O " " "
H " " "

Acid Potassium Sulfate
O Platina bleaches
O Aluminum "
H Zinc
Salt:- H Iron & Platina inferior marks
O Platina bleaches
O Aluminum bleaches

Sulphuret Potassium
O No good.
H Aluminum bleaches.
Salt added. O Copper very sensitive
"sticks to the paper"
O Iron more sensitive than copper
O Nickel very sensitive not so black
as Iron but will probably give better
results as Iron tipped "potassium
bottle
O Platina bleaches
H Nothing

Ammonium Arsenate
O & H nothing
Salt added,
O & H Nothing

Iodide of Potassium
O Platinum good marks but fades
off on the ear like a generator
Salt added
O Tin inferior
Copper marks when it has
got an oxide on only
H Iron slightly

Potassium Ferrocyanide
H Platina quite sensitive
H Copper not quite so "
Like Copper Iron tin not sensitive
O Nothing.
Salt added. O Nothing
H Platina quite delicate
all about same

Sulphate of Mercury.
O ~~Iron~~ no good.
H " "

Nitro Prussiate Soda
& and alkaline Sulphide
Intense purple color for a time
Iron mercurized give mercurial
metallic black =

May 24 1874 Plat. Sil. Cop. Aluminum

Decoction Brazil Wood

1/2 Decoction 1 teaspoonful of Chemical

10,000 ohms. (3 cells carbon)

1 Hypogallic Acid

O nothing

H slightly Platina + Sil

with salt

O Copper fair comes out on exposure

H Platina ~~quite~~ sensitive

Sil middling "

Copper quite "

Lead " "

Zinc " "

Cadmium " "

Iron " "

2 Iodide Potassium

O Platina only

H Platina quite sensitive not quite as sensitive as I.P. but more permanent

Sil sensitive

Silver "

Copper more sensitive

Lead + Zinc sensitive

Salt added

O Sil slight mark + Plat good

H Platina almost as sensitive as I.K., Sil about same

all other pieces about as sensitive as each other

Cadmium, Nick, Thallium, Al. lead Zinc

3 Bichromate of Potash

O Silver light mark

Cadmium fair

H nothing

Salt.

O nothing

H nothing

4 Sodium Acetate

O Plat. slightly bleaches

Nick. quite sens. comes out in air

Iron. " " " " " " black

H Sil sensitive

Plat. "

Salt added

O Cop. very sens. comes out in air

the rest about same

H about same as in O.

5 Acid Potassium Tartrate

O Plat. bleaches very sensitive

Sil " sensitive

They most all bleach

H Plat. red mark

Sil sensitive

Salt added

O Plat bleaches very sens.

Aluminum " extremely sens.

H Lead marks

Cop. marks

Sil sens.

A

Sulphocyanide of Potassium
O Plat bleaches extremely sens.
but fades out
Aluminum bleaches about same
Iron sensitive comes out black
Zinc bleaches
H No good
Salt added
O Aluminum bleaches very sens
H No good

Potassium Sulphate
O Zinc no mark
Copper quite sens.
Nickel " "
H Platina extra sens.
Zinc " "
Cadmium better
Aluminum & Lead & Copper good
Silver & Iron good.
Salt added
O Zinc slightly
H no better

Potassium Carbonate.
O nothing
H nothing
Salt added.
O Copper is the only one that marks
H Nothing

Benzoic Acid
O Nothing
H Nothing
Salt added
O & H nothing

Potassium Ferrocyanide
O. Nothing
H Platina black
Zinc "
Nickel pale
Cadmium pale
Aluminum "
Zinc "
Lead "
Salt added
O Acid amount & anything
H Plat sensed
Zinc a little more sens.
All metals mark about same

Lead Acetate
O Nothing
H "
Salt added
O & H mix

Citric Acid.
O & H Mix.
Salt added.
O & H Mix.

Potassium Nitrate
O Copper quite sens
H Platina sens.
Iron. sens.
Salt added
H Platina sens
Zinc "
Tin "
Tellurium "

Potassium Sulphuret
O & H Nothing
Salt added.
O Iron slight
H Nothing

Sodic Phosphate
Copper quite sens
O Iron " black mark
O Zinc good for antiprotion by electrolysis

Salt added
O & H Mix

Sodium Hyposulphite
O Mix
H Platina very sens.
Zinc more so.
Marks on all
Salt added.
H That more delicate
~~Decreases delica~~
Increases delicacy of all.

Carbonate of Copper
O & H Nothing
Salt added
O & H Mix

Sodium Sulphate
O Mix
H Platinum slight mark
Salt added
O & H Mix

Sulphate Mercury
O Mix
H Mix
Salt added.
O & H nothing
Zinc marks without water

Oil Nitric Acid
O & H Mix

Chloride of Ammonium
O & H Mix

Arsenate of Ammonium
O Mix
H "
Salt added
O & H Mix

Nitrate Strontia
O mix
H. mix
Salt added
O mix
H mix

Sulphate Copper
O. lead slight mark
H mix
Salt added
O. no mark on lead.
H mix

Caustic Potash
O & H mix
Salt added
O & H mix

Aniline Sulphuret
O mix
H mix
Salt added
O Tin faint mark comes later after
H mix

Formic Acid
O. Tin light mark
H mix
Salt added
O & H mix

Phosphoric Acid
O mix
H mix
Salt added
O & H mix

Sulphurous Acid
O mix
H Tin slight mark
Salt added
O & H mix Sl Lens.

Hydrarg Nitric oxyd.
O mix
H mix
Salt added & it all solidified

Boric Acid
O. mix
H mix
Salt added
O Tin light mark
H nothing

Sodium Nitrate
O mix
H Not very delicate
Sn " "
All others " "
Salt added
O Sn quite sens.
H Platina more sens than before
Sn " " " "
Selenium very sens, permanent
All the others more or less sens

Ferridcyanide of Potassium
O Iron very slight blue
H mix
Salt added
O Copper slightly
Look sens
H no good.

1874
July 26 Cobalt pen. Sulphide of Ammonium

May 24 1874

Guaiacum dissolved in H_2O
10000 ohms 2 cells.

Pyrogallic acid
O mix
H mix
Salt added
O mix
H Iron yellow Root delicate
Tellurium very delicate

Potassium Iodide
O Plat
H Tellurium extra sensitive
Salt added
O Platina
H Tellurium same

Bichromate of Potash
O Lead & Zinc only
H mix

* All hereafter mix with salt

Lodium Acetate
H Tellurium good

Acid Potassium Tartrate
H Tellurium only

Potassium Sulphate
H Tellurium

Potassium Sulphocyanide
H Tellurium

Benzoic Acid
H Tellurium only

Potassium Carbonate
H Tellurium only

Acetate of Lead
Mark O Zinc & Nickel
without battery.

Ferrocyanide of Potassium
Nothing

Potassium Nitrate
Mix

Citric Acid Mix

Sodic Phosphate O
H Tellurium very sens

Sulphuret Potassium
10 Gran more sen. than Required

Carbonate Copper
No 900

Sodium Hypo-sulphite
No 900

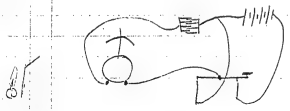
Guaicum can slide off on
its ear after this Gr Stick to the
contrary notwithstanding.

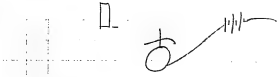
Ea B 60 hr.

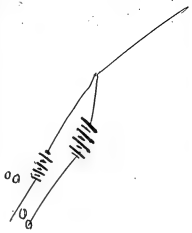
Lest to see how much water is driven
off the Boston albuloid paper by the
application of the baking process

Lot H. 1 ℥ of Paper – 480 grains
Baked it for 20 minutes when
it weighed 446¾ grains
which is nearly 7 per cent.
Baked 45 minutes when it weighed ~~458~~ grains
which is nearly $\frac{.944}{7.000}$ a little more than 7 percent.
Baked it 1 hour the last quarter at higher
heat. 443½ grains = $\frac{.946}{7.000}$

Ground colour with D Amm. Amm + Sulphide Iron







Christophal Energer
Sean Paul Richter
Paul Seventy Two
Paul Eighty Thousand
Paul Ninety Six
Paul my Golden dream
Soul

Collected
Showing 25 300
7500

landed

Who will care from my little cot
And just see in the cold cold spot
Will there I would to or not
My Mother —

I tell you what an operator
Is a most mysterious Crathur
With ~~his~~ + elegance they dress
But how they do it I Cant guess

If a man who 'counts' cries
Can not when his father dies
To a pump that he would relize
Have a crump from his pulley

If a man who does not well
To tell another go to hell
His nose gets masked his eye banished up
He's rightly served the Cured pup

How nice it is in panic times
To have a pocket full of dimes
I used to know how things myself
But now alas I'm out of pelf

When you owe your Livery stable
And to pay you are unable
Obliged to walk off on your ear
I tell you it feels awful queer

Oxhydre	14 × 9⅓ =	1279	1.26
Hydrogen	1 × 9⅓ =	9⅓	31
Ox —	16 × 9⅓	1461	48 7
		1461	48 7
		1461	48 7
1200		57 53	1200 / 1500

.80

1.26

1461
087
087
086
1461

14
9⅓
1265
279

16
9⅓
16
14 65
1461

Paul St Virginie
The Loss of Julia
One of the things which happened
A hobgoblin that roosted on the
Pillow of Stevenson

Christophal Energer

Sean Paul Richter

Paul Seventy Two
Forty Eight Thousand
Rock of Saints
Paul my
Golden dream
Mouse

Colorado
Scattering 25
300
7500

Excommunicated
Effusiveness

Phrenological
Poisons

The Screen of
Foreign Angel

Left handed
Rondezvous

The minds meanderings

Cherokee Prions
Photography of Saturn Prions
Lucifer Prions
Telegraph
Hell Auction Hot Air

The Little Chorister
Sat up for a long time

Plato the immortal said, Gentlemen
Where did the first sense
The nature of sense is commonly
(Plato himself said it first you know)

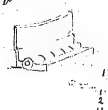
If a man who

33

20 = 33 -

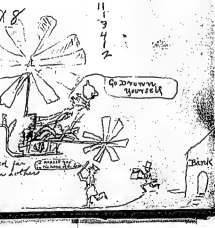
20 | 33 | 1.65
20
1 30
1 20
1 60

98

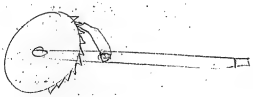


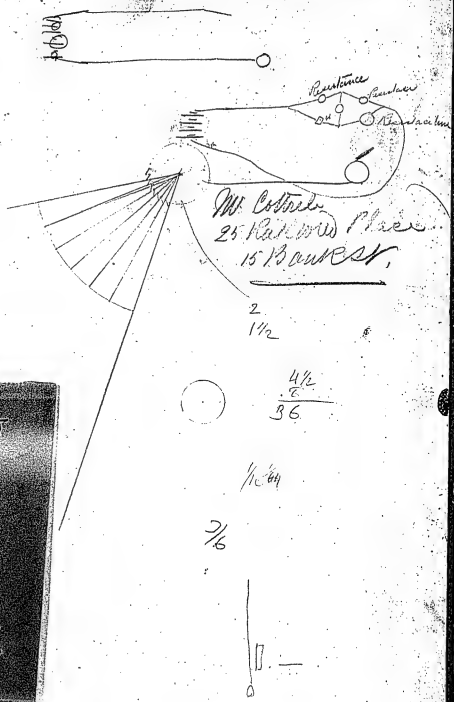
1227.

1
11
3
4
2



J. E. Barnes patent
Flying machines he recommends for
Sales & Pinkerton clergymen brothers





[ITEM FOUND IN BOOK]

Laboratory Notebook, Cat. 1171

This notebook was begun in 1873 and contains only one dated entry, for April, 1874. Most of the notes and drawings are by Edison. There are also a few entries by Charles Batchelor, including notations of hours spent on experiments. The material relates primarily to diplex, automatic, and chemical telegraphy. The front cover has been labeled by Batchelor: "Experimental Researches Vol. 1 Edison's Laboratory." The book contains 148 numbered pages.

Blank pages not filmed: 108-117, 120-148.

Missing pages: 1-24.

Experimental Research

Vol. 1

Edison's Laboratory

Try experiment on the delicacy of a frogs leg. it is stated by Pepper that a frogs leg is 36 000 times more sensitive than an Electroscope (Condensing) this frogs leg may be arranged to work a second circuit by attaching a circuit breaker to it. It is possible that a live frog may be used, in this case the instrument would be of a permanent character.

Remark

Try if the freed oxygen from a chemical recording pen can be attracted away from the pen and a decomposition partially prevented, by a powerful local magnet with pointed poles the object being to attract the oxygen away from the iron pen after the current ceases to prevent an elongation of the mark upon the chemical paper, Thus.

It is stated by Pepper that Oxygen is magnetic

Mix a solution of Pyrogallic acid with potash and make some chem paper, p & iron pen, Pepper says freed oxygen gives a dark brown color.

Try chem paper in solution of Sulphate of manganese.

Schonbeins test for ozone is 1 part Iod Pot in 200 parts distilled water. 10 parts starch thickened by heating. brushed on bibulous paper. Try effect of decomposing with pens.

Pepper says ozone is present in the oxygen tube of a Voltometer. which shows that both are set free

[LEFT PAGE IS BLANK]

Ozone bleaches Black Sulphide of lead or plumbic sulphide, oxydization takes place, and white sulphide of lead formed. This may give good high solution.

Powdered Antimony becomes very hot and combines when placed with iodine.

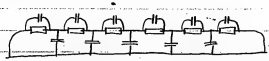
Palladium absorbs great quantity of hydrogen Graham used two coils like a watch spring immersed in water (acidu prob) and connected the two ends to a small battery, decomp of water took place the free hydrogen being absorbed by one of the spirals of palladium which quickly expanded when the current was reversed the first coil contracted and the other expanded It may be that with a proper coil arranged with a lever that the smallest current could be made to work the lever and close a secondary circuit or with mirror throw a light upon a screen.

Test schober paper - also Boston.

Procure samples for chemical decomp of paper.

Ascertain the difference if any upon artificial cable between 20 cells high R and 20 cells very low R.

Ascertain if with an artificial cable of a capacity of 1000 miles the condensers and resistances of another 1000, can be arranged as below to entirely destroy the static charge.



find at what degree of dryness iodized and sulphuron paper is the most sensative.

1893

Ascertain the highest practical speed attainable with a short relay operated by perforated paper upon 300 mile line have. Static capacity of regular with proper amount of leakage to allow the discharge of relay to have its proper evil effect. The record is given upon Iodized paper. The relay repeating into local circuit. Try speed with the relay armature at different distances away also shunted with condenser, magnet etc diversify. Then at best speed substitute Morse Register and large local and obtain highest speed. The polarize Relay on one direction with large permanent magnet and see if speed is increased or decreased. Then on same circuit substitute 200 ohms Relay R for 100. Then 50 ohms and see if decreased induction is of greater consequence than decreased strength. Then substitute a regular polarized relay with shunt on trans. and extra bat or N 25 P 50 paper cutting out P and obtain highest speed here.

The matter in Butternut Shucks give a color with Sulphate of iron, get Butternuts

Chloroform is a test for iodine.

Experiment with the instantaneous formation of metallic tin flakes by Chem Decomp in glass & on paper to form metallic dots & dashes in paper for repeating.

Experiment on the speed, strength of Current and form of coil which is best to work by induction it may be a primary of 20 000 ohms R and a secondary of 1000 ohms will work with very delicate current.

Ascertain if a given battery will just give a perceptable mark through a large resistance, if by using a primary of high resistance and good second if this mark can be augmented.

Try telegraphing from NY to NY via Albany by work armatures only.

Try Littles Solution more carefully. Formula. 12 H_2O 4 ph Sat Sol Chl Calcium 2. Sat Sol Prus Pot. add Chromic acid till it gives a cherry color then add $\frac{1}{50}$ part. Chl Sodium.

Look at English Pat 2429. see if unison worm anticipated

Get date contract with G & J. and make list Patents out for Edison.

Duplex experiment - Sending two messages in the same direction over the same wire.
The principle is sending reversed currents recorded on a polarized relay for one message and increasing and decreasing the strength of the current to effect another relay. The evils to contend against is to prevent bad effects upon the relay worked by increase and decrease at the moment of reversal, in sending P & N Currents through an ordinary magnet or Morse Relay. The cores must entirely lose their magnetism of due from an N current before they can acquire an opposite polarity due to the P current, at the moment of the polar change there the magnet exerts no force upon the armature hence the spiral spring will draw the armature away from the face of the magnet for an instant, and when the reversals are very rapid the armature lever scarcely comes in contact with the front contact point. To get over the effect of this upon the local circuit containing the sounder, which in this case would

vibrate at each reversal and work the sounder. I reverse the ~~useful~~ usual method of connecting the local circuit and make connection with the back point, so than when the lever of the relay is away from the magnet, the local circuit is closed. This closes a repeating sounder, (ie) a sounder whose lever breaks and closes another local circuit on when this sounder is closed it opens the second local circuit. So the same effect is brought about as if the relay lever operated the local circuit and sounder in the ordinary way. The reason this secondary plan is used is because when the current upon the main line is supposed to be of full strength and the relay closed the reversals constantly tend to vibrate the lever as the lever flies away from the front contact point but the cores of the relay become re-magnetized and reattract the lever before it touches the back point at a slow speed consequently the repeating sounder is unaffected and of course the receiving sounder. but if the reversals are sent very rapid the lever of the relay makes a slight contact with the back point this would close the secondary sounder were it not that that sounder being a non-receiving instrument may be adjusted very high consequently the slight contact which the relay lever makes with the back point on the act of vibrating is insufficient to allow the repeater magnet of to reach it maximum strength which is necessary to overcome the tension of its spring.

If I find in actual Trial this.

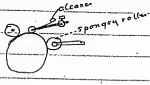
R varied from 800° to 9000°. ~~That the~~ relay. (Phelps 126 ohm) ~~with~~ Gallery reversed by Double springs operated by sounders. Number of cells increased or decreased by a second sounder and contact spring polarized relay 75 ohms. 8 cups always on for working polarized relay increased by adding 16 cups Working sounder by 16. That on 800 ohms Perfect

signals were received and relay had great amount of margin increased to 1000. signals perfect. margin on adjustment of relay increased. increased to 2 3 5 7 & 9000 ohm margin on relay increased with increased resistance. decreased extra battery to 8 cups results same decreased battery 8. regular from 8 to 4 cups signals just as perfect. inserted in line two 200 ohm relays. signals on high resistance 3000 & 4000 ohms perfect, but on low resistance 500 ohms inductive discharge prolonged the opening at the moment of reversal when inverted currents are sent through ordinary electro-magnets the inductive discharge are much more powerful than when a current of one polarity is intermitted hence the inductive effect of the coils of the receiving magnet themselves are seriously effect the adjustment on short circuits, because the current which passes through them is stronger + the Route for the discharge short. by reason of the low resistance of the circuit, One curious thing observed in this experiment is that with a permanent reversable current sufficient to work the polarized relay. that the ordinary relay may be adjusted to give good signals by the addition of but 3 cups To the permanent battery on a R of 8000 ohms The battery may be increased from 8 cups to 40 without effecting the adjustment of the polarized relay.

Trial in New York unsuccessful on account of probably Relays in line, insufficient battery. Battery on line direct by cross or leakage. & difference in R of Relays. used & poor facilities

make 4 rolls of different strength Sulphit Pot paper.

Have Acid Trans fixed thus

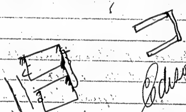


iron roller per which must be cleaned as it revolves and newly moist Sulpt Kale paper with extra sponge roller to dry in passing through machine - Impossible to keep Roller Clean -

A Sulphate or any battery having zinc is more constant in light than darkness, vide zinc in Chem Solubilities,

It may be that instead of changing the amount of magnetic resistance to cut the working that it may remain constant and an adjustable Rheostat placed in that side of the shunt containing the receiving paper. — with no good a paper having a resistance of several hundred miles I can conceive how the shortening of the resistance of the magnetic shunt can bring any perceptable quantity of current from the line Considering the immense resistance of the paper Therfore I think that decreasing the length of the magnetic shunt does not furnish much more if any counter discharge but only weakens the Effects of the static so that it is imperceptable on the paper. If this is the case it is better to use one high resistance magnet only in the shunt and regulate the weakening of the static by an ordinary rheostat in the shunt containing the instrument, This will make the resistance at the receiving station much greater than in the old plan hence less discharge will run out or be attracted to that end The bulk going to earth at the transmitting station,

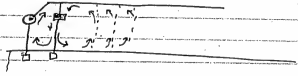
It is possible that a very fine wire magnet



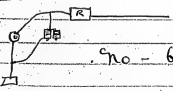
Edison Batch to Lower
all Night
12 hours

having a resistance as high as 5000 ohms used as a shunt and and a Rheo in the other branch properly adjusted might be able to give a greater proportionate Counter charge than the ordinary method,

I think that in wet weather the efficacy of the shunt is much less than in dry weather, as the discharge from the magnets in dry weather have but one route practically through the paper while in wet weather there is an extra route for their discharge viz the derivations or leakages near the receiving end thus

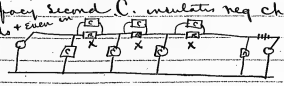


It would probably be a good idea to insert a plain rheo as shown below to increase R. of the extra route of the discharge, & thereby deflect it upon the paper & at the same time weaken the main & static charge so that the Counter discharge would bear a nearer proportion and be able to overcome — A noticeable change for worse



No - bad effect

Try this experiment — the additional R. X necessary to get efficacy second C. neutralizes neg charge, exactly as much as it adds + even in excess, so its failure

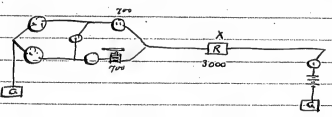


It may take double or thrible the number of

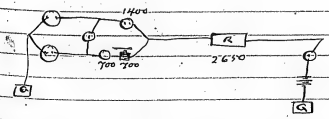
condensers to shunt the resistances as the other to kill the static charge, as a portion of their discharge is killed or short-circuited by the R themselves and do not go on the line.

Tried Extra R brought in counterbalance Exactly the good Effects of the Extra Condensers In fact it did more harm than good.

Test to ascertain if the discharge from a magnet is lengthened by an increase in the resistance of the circuit in which it discharges. Thus



Increase the length of R of the discharging circuit but insert a galvanometer in main circuit so that the same strength of current is observed. The loss due to the increase of the inductive circuit is made up by decreasing the resistance of the R Rheostat X. The same strength of battery will pass through the relay but the R of the discharging circuit will be doubled. Thus

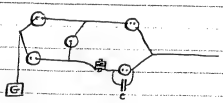


This arrangement should give a weaker but longer discharge if the discharging time depends upon the exterior R of not then the discharging time unlike a condenser is independant of the the r of the discharging circuit.

If the current is not weakened the tension must go very high.
Remark

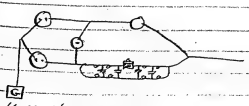
Try sheet lead for secondary batteries, also sheet iron and tin, etc

Try this



Cleaned & polished 26 hours

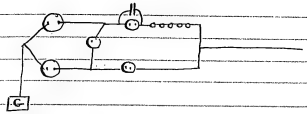
This



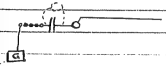
Kill the discharge.

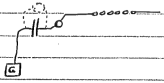
[LEFT PAGE IS BLANK]

Try this to lengthen the discharge



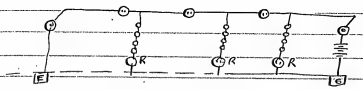
This



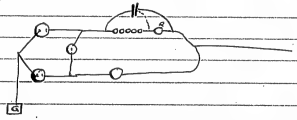


Try the amount of discharge from 6 bottles with water alone, and with various quantities salt, also ~~was~~

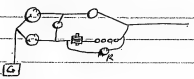
Try this and ascertain if the action is not like a cable



Try this.



This - The placing of the secondary battery in the direct circuit branch instead of the shunt alters its action as regards the relay but not the line, hence by placing it in this way, the sticking of the relay may be prevented thus



Remarks. both ways work. the cause of sticking is that on the opening of main circuit the secondary sends a longer charge than the relay and the excess goes out on line opposed to the static chge. but a portion circulates with

[LEFT PAGE IS BLANK]

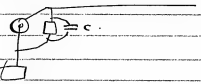
The shunt and this excess makes the relay stick. This is good thing for line but bad for relays. But as the R of the Secondary can be increased, it will not perceptably interfere with the relay. The remedy is to get the Secondary pile to send shorts after Currents. 7 cells kill the inductive discharge of the heaviest relay I have. 1400 ohms. The R of 7 cells well Sealed is about 600 ohms with only water 5000 ohms. First way made relay stick worse than a plain shunt as the 5 battery Current was added to discharge but placing it in last diagram it works against & you cant stick relay but acts same with Relay 1400 ohms dash comes thus - shunt here sending End. none R end.

Twas the jar of circuit closing lever - made secondary Contact

In my reversal duplex, the effects of the discharge Current from the ordinary & polarized magnet interfere with the ordinary relay making it vibrate while the polarized is rendered sluggish. But if the secondaries are applied as shown and not too strong & the shunt is considerable it entirely destroys the effect of the Secondary discharge from relay - and a greater margen is obtained on the ordinary relay while the polarized Relay follows the reversal key promptly - ~~When~~ When a positive Current has been on line for any length of time say for a dash the Secondary battery becomes highly charged & when the Current is reversed this charge acts with it hence this wave will be stronger than the other and it is this that interferes with the ordinary Relay to a some extent as this relay depends on Changes in strength of Current - still I think the secondary will benefit greatly this

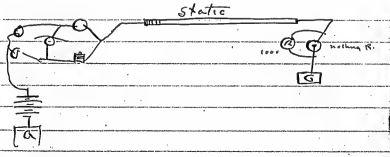
form of Duplex

Try this



Passing Oxygen down one side of a platina Electrode and hydrogen (common gas) down the side of the other platina Electrode immersed in Water Acidulated with Sulphuric Acid and also again with Chloride Sodium gave no Current perceptible upon a 6 ohm Sounder of a delicate 126 ohm Relay

Try experiments with Battery at sending — mistake at receiving End only Thus



Try a line statically fixed as one side of the bridge to study its nature.

Edison — Batchelor 16 ohms

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Test the induction

Chemical Solution:

To a gill of water add tea spoonfull Nitrate Ammonia. To this add what is held on small Knife blade of aurichloride of Sodium, The paper is white, the marks with iron pen are blue, but with a fein pen yellow at first but soon become purple. (purple of Cassius). The sensitiveness is increased by adding a slight amount (less than of of aurichloride of Sodium) Bichloride. There appears after a few hours a continuous mark running through the dots and dashes, — Bkl Sodium does not appear to act as well as Nitrate Ammonia

Find out if it is the addition of the Corrosive Sublimate (Bichl) that cause the continuous line to appear

When Ferrocyanide solution, with Nitrate Ammonia as given in Culleys book is used the iron pen is polarized and even on very short circuit the dash commences thus

When Sulphuret of Potash is used the polarization of the pen is greatly augmented

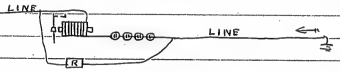
Make 3 Large Secondaries with Calland jars & pure water to get a shorter after charge.

Edison & Batchelor 12 hours

Roughen the surface of the electrodes of secondary battery to allow of escape of gases more quickly so as to give a shorter after charge.

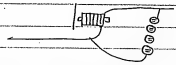
Test with line composed of 6 relays alone. Then place secondaries to each and see what induction of any increase and decrease the number of secondaries to ascertain what is the smallest number that can be used.

I find that the secondaries should be arranged with the relays thus and not as a shunt



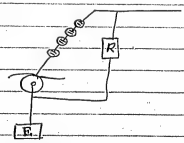
The magnet tends to send a current after the battery is taken off to the left. The secondary battery to the right. The two sources of power keep all portion of the derivation circuit at the same potential hence no current is generated. If too many cups S are used the current from them is greater than that from the discharge of the magnet, ~~too~~ this would close the relay again. But if the number of cups are reduced the balance can be obtained. or the resistance of the shunt may be made greater and the balance obtained in that way.

In ~~receiving I~~ If the cups are arranged as a shunt thus.



It is obvious that as the magnet generates a current opposing the main current on closing and in the same direction on opening. and the secondary battery ~~sends~~ reverses this order that by placing this in the shunt. the two electromotive forces within it are working together, although the inductive effect will not go out upon the line, the relay is made to work sluggish owing to the currents both from the magnet and secondary battery circulating in the derivation after the main battery has been disconnected.

In ~~the~~ receiving with a secondary battery is should be arranged with the receiving paper the same as with a relay Thus



In a trial with Baltimore seven to eight hundred words per minute were received with Relay at Phila. shunted. With no Earth shunt at Baltimore, The number of Cups first used were 15. but 200 words could be received. The number of Cups were increased to 30. with the above result I presume that with 100 Cups almost any speed

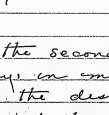
might be obtained with shunt and probably without shunt at sending station.

Secondaries well salted. have the Ends of the Electrodes barely touch the water see if the gas does not escape more readily and give a shorter discharge — No. ~~less~~ increased R decreased discharge

Use two gutta percha wires stripped bare for 1/16 of an inch at ends immerse in bottle to bottom see if pressure does not force gas up

The with charge is doubtful - It may be that at the monement the current is closed. ~~to~~ but little gas is formed and there is no opposing current set up by the secondaries but as the gas increases an ~~new~~ opposing current is generated and this weakens the main current.

Make a secondary battery of disks of copper, cloth & paraffined paper thus



Attach the secondary batteries to the two relays in my Reversal Duplex So see if the destruction of the induction of the magnets does not make less opening of the armature

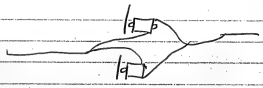
of the Ordinary relay.
Yes vast difference - there is slight difficulty if the Secondary battery is allowed to be discharged if a long positive has been sent a negative. Current will flow from the battery when the main battery is taken off as it is not taken off but is followed by a negative this in addition to that of the secondary battery makes the negative wave stronger than the preceding positive & thereby interferes with the adjustment of the ordinary, but I think that if the Secondary is proportioned so as to neutralize the discharge from the magnets only no difficulty will be had from variation in strength of the Current -

Salt well all the secondaries on hand. Connect for intensity connect them to a fine relay. Then take 6 cups Carbon battery & charge 6 secondaries at time quickly one set after another - see if these intermittant charges are not Continuous on relay -

In charging the Carbon battery Current is thrown into Circuit through high R of S battery this kills effect this Experiment but the relay shows Continuous Current less that due from cutting in

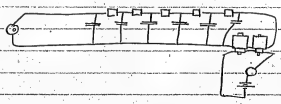
A Revolving Rheotomate might be arranged with several sets of Secondary batteries, and a charging battery, so that one set could be charged for an instant thrown into Circuit and the previous one

withdrawn & so on. Problem.
Does 100 Cups secondary Charged with 10 Cups primary have the tension of 100 Cups in discharging or only 10 Cups; = 3 cup alternator on 6 volt. charger it should last 1 min - trouble is to keep ckt closed when charging just from one charged battery to the other keep chg rate %
Connect two relays. Thus & ascertain if the discharge of one neutralize the discharge of the other



No. Each relay generates ½ as much induction as it would if all the current passed through it. the two send their charge upon the line in the same manner as any two electromotive forces of the same X. would if arranged in this manner

Duplex relay=work over line by induction current



arrange in first place with battery direct with 300 ohm shunt and small relay in, with best magnet shunt at receiving end, and increase R so that it is impossible to get 100 perfect words per minute, then replace shunt by double coil relay and work with induction currents SEE if 100 can be obtained with these induced Currents.

Wet 10 rolls Baston perm Reg for seconds.

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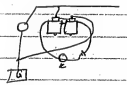
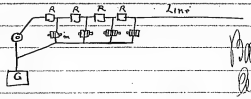
arrange as above (previous inductive Ex.) if induction don't work and replace shunt and use Duplex relay as receiving shunt. use one Coil only. Then arrange a Box of battery with a Bradley Rheo. with second coil, & unplug till the main line current neutralizes the Local Current and leaves an excess, The Theory being that the reversal of the polarity of the iron cores generate more induction than without second Ckt. Try both with & without second circuit Try without battery by closing coil thus



add Condenser thus ∅

Put Duplex relay in bridge, balance The put a second battery to second coil. to as to balance Effect of main Then see if there is any induction if so if it is not in the Contrary direction to what it would be regular —

also.

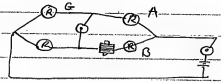


Patented 7, 12
Edison

[LEFT PAGE IS BLANK]

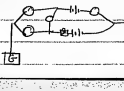
Tried it OK

Try this — Obtaining the inductive effect free from the main current and regulating the Cattle so it will just make the dashes.

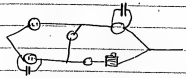


All sides being equal in Resistance no current from the battery passes through the chemical or other instrument in the bridge wire, but the inductive action on the opening and closing of the main is generated within the circuit formed by the two sides of and the bridge. The currents are recorded upon the paper. Any inductive arrangement acting like a magnet Condensor etc may be inserted in these branches and the inductive action observed free from the Currents which form it. The difference in resistance of the different apparatus which it is desired to observe is equated for by the Rheostat A. B. so that the same quantity of current is made to pass over the two branches in all Cases, and extra magnet inserted at G doubles the effect. If placed in the top branch if placed in the lower branch it neutralizes the effect of the other magnet. This device is very convenient to observe the polarization in liquids with metallic electrodes.

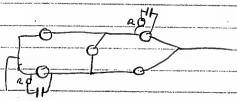
See if the inductive effect of the magnet is affected by the batteries balanced in the bridge thus



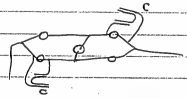
Try this



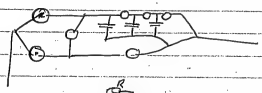
Try with magnet & without, see what condensers will do. Then this to get longer charge



also



Try this



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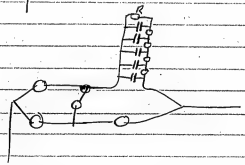

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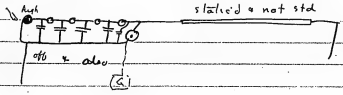


Try if working on well statied line is doubling quantity well form dots + dashes thus Be careful

The excessive amount of iodide of potassium used for the regular solution led me to believe that only a certain amount was necessary to give good mark and the balance only increased the conductivity but I find that by using a small quantity & adding the sodium to give the requisite conductivity that it a failure & the excess of iodide of K is necessary probably some other method might be used that would not redissolve the Iodine & at same time give the paper proper conductivity.

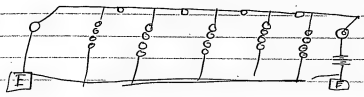
Try effects on Duplex relay in bridge by closing second coil = Nothing Noticeable =

Try receiving on well stated line with battery at receiving end ~~and arrange thus~~

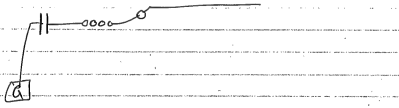
Try and see if a number of bottles with pure water only arranged along resistance after the manner of an artificial Cable does not imitate the Atlantic.

Thus

over



Try this to lengthen the discharge.



Get double pen holder made.

Get some Alcohol. Eggs for albumen. Charcoal
White Sugar. Onions. Red beets. Red
Cabbage. Syrup Violets Petal. Red Rose
Hollyhock flower. Brazilwood.
Yerba mate. Lump of manganese.
Sub Chloride Copper

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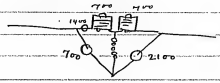
Try this on Shop circuit to see if it kill induction. second to see if Relay doesn't stick



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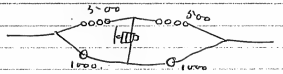

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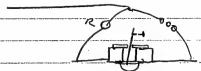
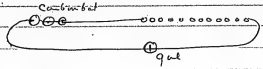


No good seemingly
Varies according to time
Closed & again it works
but unpredictable for
about reason

See if any induction from this

Find out what that thump is that is felt by finger on recording pen when paper only wind Ckt broken.

Try this

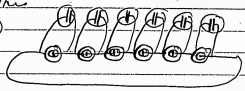


No good

Try ferrocyanide & ferric & nitrat tin & after very dip in Sol Nitric & Pyrogale & and

Treat foil with Sol Gall. go for marks to make them immediate =

Try this



See which is strongest 6 with Secondary or without. The Secondary slowed 6 well Salted = adds nothing cuts off in direct weaks by opposing it with K.
heat iron receiving pen with glass tube pointed with flexable rubber pipe to gas. to see if the protoxide is not more readily formed.

Chemical Solutions
Try Caustic Potash - Water - iron pen -
- No Mark —

Try Carb Pot. iron pen - water. - Salt

Try Carbonate Pot Copper pen water - Salt
Caustic " " " " "

Try Iodide Ammonia - water starch
platina pen - Potash bleaches blue color
formed by Combination of Iodine with starch.

Try Citric Acid water Iron pen - develope in
Ferrocyanide & Ferricyanide. Try Salt.

Try - Dissolve Indigo in Sulphuric acid
iron pen. perhaps Salt -

Try Carbolic A. Iron pen water — S

Try Arsenious A. Copper P Water . S

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arsenous acid almost insoluble in water.
Readily S in B water & Hydro chlo a

Try Cyanide P. & Peroxide Iron - Water
S. Iron P.

Try Sulphocyanide Ki H_2O & Chl. Cl.

Try Ferrous Cyanide, Silver. P. H_2O ChlCl

Try Bromide Ki. ChlCl. H_2O all the pens

Get some Hydroferrocyanic a.

Try Acetic a. Salt iron P. H_2O.

Try Meconic a Iron plume, then ChlCl.

Mem - Nitro Prusside Sodium Pharm p 1456
delicate test for alkaline Sulphuets,
such as Hydrosulpht ammonia &
Sulpht Ki.

Test that have been made, recorded
slips in Scrap B. Tests of addition to
Regular Ferrid - H_2O ChlCl - Solution.

Chl Lime - mark light ~~brown~~ yellow soon
fades, whitens paper slightly, mark very
inferior -

Citrate Magnesia - Mark blue inferior

Caustic Pot. mark yellow inferior.

Phosphate Soda. mark blue which time
intensifys strongly.

[LEFT PAGE IS BLANK]

Caustic Ki & Iodine in Excess — Mark yellow scarcely perceptable,

Aqua Ammonia, Mark drab, inferior very

X Borac Acid, Mark Blue - Good but slightly inferior

Silicic Acid - Mark Blue inferior - S acid insoluable

Sulphate Potash. Inferior slightly

Carb Soda - light blue mark very inferior

Saltpeter - Blue mark Slightly inferior

Sulphate Copper - Blue mark. Slightly inferior

Sulphate Soda Blue mark. Very "

Formic Acid. Blue mark Slightly Infr

X Acetate Lead. Si; Inferior, after paper dry it is white

Alum - Inferior

Cyanide Pot. Mark yellow very Inf.

Carb Ammonia, Mark light drab very Inf.

Stearic Acid insoluable — dmt effect

Hydrosulphite Soda - marks unchanged

Sulphate Zinc No mark

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Arsenious acid — no change

Sulphuret of Calcium - blue mark very Inf.

Iodide Potassium Blue mark Inferior

Muriate tin - no good without Salt, probably poor Conductor.

Benzoic acid Blue mark. Very Inf.

Galls. " " " "

Acetate Manganese " " "

Ferrocyanide K. " "

Nitro Prusside Sodium " "

Spirits Camphor - precipitate, no chge if any slightly Inf.

Chromic acid very inferior

Nitric & Pyrogallic A. no regular ory inferior with both am & tin pen

Hydrofluoric acid very inf.

Flowers Sulph. insoluble

Oxalic acid Blue mark slightly Inf

Chloric acid " " "

Potassic Sulphocyanit. " "

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Nitrate Cobalt. light blue - very Inf

Silicate Soda. Blackest blue. slightly Inf

Bichromate Pot. Ragged dark blue mark. Slightly Inferior

Ammonia Citrate Iron - Green mark S. Inf.

Bichl Mercury " "

Bichromate Pot & Sul A. very strong when leaves pen. fades to light green. Inferior Ferrid added in Excess. "

X Starch added. gives the paper a glossy appearance Whitens it and the Turnbull blue is deposited in a great measure on the starch which gives mark a fine sharp appearance and the Color is somewhat deeper than with the regular Solution.

X Sulphuric Acid added gives a deeper mark than regular owing probably only to reduction in R of paper which would be a little worth an long enquiry.

Nitrate Silver - Better than Reg. ~~no~~ deeper mark -

Black Ox Manganese light green mark. Inferior

Sulphuric A. & Ferrid alone - very Inf

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Peroxide Iron — good. deeper than reg — mark ragged.

Gallic Acid — Blue mark. Inf slightly

Hydrosulphuric acid — Inferior.

All above test is shown in Chemical Strip in Scrap book
Allison & Mitchell 21 hours.

Test the induction on a clear line of the relay in balance or bridge. Then with a line of same R. Statically arranged. Test the amount and character of the induction from same relay and observe what effect the gradual fall of the main current has upon the induction discharge. Try same with Secondary batteries.

Make four bottles secondary battery, place them in one side of bridge. first fill with 4 pennyweights Muriate Ammonia then 4 do of Sal Soda — Alum — Bich Pot — Iodide P. — Tartric A — few drops Bil Sodium — Nitrate Ammonia — Glacial Acetic A — Citric A. Sul Cop — Sul Acid — Hydrid — Sul Zinc Black Ox Mang & all the other Chemicals

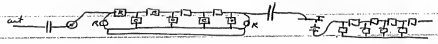
[illegible]

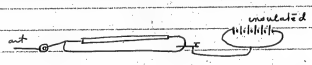
[illegible]

[illegible]

Cable Experiments -

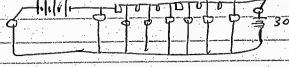
Transmitting a P. Current both through ground and Cable with two static attachments for grounds.





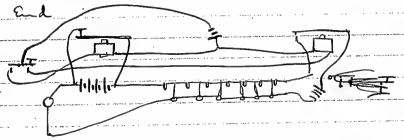
See what speed obtainable on 9000. Ohms R with one cup battery Iodide paper. If no mark try to improve Iodide ppr. till mark obtained

Try this



also test if a Voltaic Battery put in circuit immediately aft the dot has been made sent + the sending End to air will have any effect in stopping the flow from the Condensers. Use same number of Elements to Kill Charge from Condensers as is used to send with. If it does not Kill the discharge or have any Effect then

It is perhaps possible to transmit with Voltaic & Static E at the same time and perhaps a Compensation might be devised upon the difference in these two forms. It is also possible that it is better to work at Sending End with Static from an artificial, or to make the mark with Voltaic & Send Reversed with Static or Vice Versa - Try with 20 P at receiving End and 20 N in Same direction sending End



Also reverse send with P & N the Batty at Rec End to appear static when Cut in.

I have noticed that a Morse Relay on a Regular line works much sharper with a battery at both Ends than when the battery is at the Sending End only when the latter is used the N - the stick and the working a light which is not the case when 2 batteries are used. The sticking acts precisely like the effect of the Static Charge - Of Course when 2 batteries are used in opening the Circuit One battery is Cut off but the battery at receiving End remains on & perhaps keeps the line

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charged or prevents the static from flowing out. If it however performs some good function test this —

It is possible when we consider that both batteries from the static that it would perhaps be better to have several times the number of cups at the receiving end as at the sending end.

Ascertain if the induction is as great from a magnet with its cores nearly saturated with magnetism as when it is free from magnetism. Use a bridge and a duplex relay the extra coil having a good battery permanently attached to it the bridge connected to the line free of static. Be sure that the magnetism in the cores due from the local is the same as that induced by the main battery.

It is possible that 40 cups kept permanently on the cable at receiving end the signals could be made better by throwing in + out 10 cups at receiving end without breaking circuit than they could by using the whole 50 at sending end.

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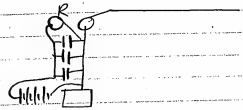
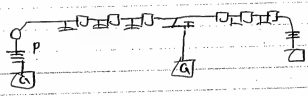
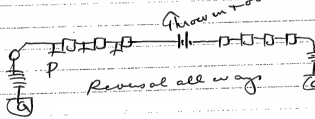
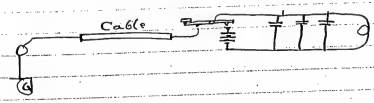
attract the static.



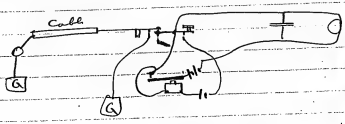




Use the static charge to work the cable



If it is necessary to put regular to ground use the arrangement



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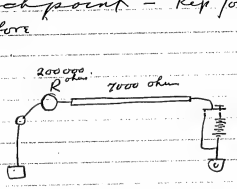
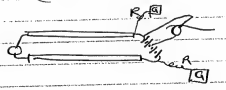
W Siemens ele proved etc - that when a current is sent along through a submerged Cable - a quantity of Electy is retained in charge along the whole surface to be distributed proportional to the tension at Each point - Rep point Com Eng p 381 Therefore



Shellac thickly the iron receiving drum or make a hardrubber one. Use 4 receiving pens for Roman on two wires place 2 pending & 2 Reg pens one letter ahead of the other two

In a two State Circs thus



In the Duplex transmitting two messages in same direction, place the secondaries in to kill self induction Then shunt the shunted Relay (common) with a Magnetic Compensator Box Journal 5 - Thus

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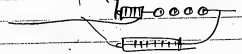
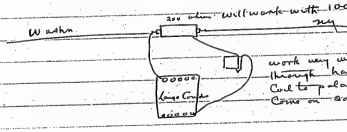
or probably this

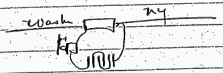


Try this Duplex on stated Line = Equal to Pittsburgh

Try it stated & Rheo with Condenser like the 3100 W plan from Washington



Tried it with accumulators 7 in one of the branches leading from Rheo in line to Condenser tried in both branches but didn't make any perceptible Change = Tried the Condenser thus



~~got~~ no Current it was probably too short to work relay

Tried this

Metals precipitated by Reagents. highly diluted. to ascertain what Metal with What Reagent will give a color at the highest dilution —

First Sol. Water 24. Fluidounces
Second — " 12 " 1 fluiddch of Acetate of lead.

1 fluid drachm of No 2
put in No 1.

a little of the solution put in a test tube
Treated with hydrosulphuric Acid —
(Vague pecep yellow prob due Sulphur free to Water
2 fldchm No 2 in 1
(Vague — Grey Opal Color)

6 fldchm No 2 in 1
(Vague

17 fldchm No 2 in 1
(Better — Standard

Sul Cop
1 fluid dchm

Fluoride of No 2 in No 1

Sul Cop	Hydrosul	No. 24 fluid ounces	No 2 12 fluid ounces			Remarks
Sul Cop	"	"	"	1		quite same with water vague
"	"	"	"	4		vague " "
				17		little vague yellow
				30		little yellow precip defined Equal to standard lead solution
Mur Tin	"	"	"	1		coarse precip
Tartar Emetic				24		" "
				40		" " further test it
	"	+ Muriatic	"	32		well defined Equal to standard
Bismuth Not has in Muriatic	} no good again					with Salts of Bismuth
				16		vague yellow add Muriatic +
Sul Mercy				32		ammonia darken Equal to standard. quite dark with Ammonia no Muriatic darker than standard
						Hydrosulphuret Am quite black Tange. darker than Lead standard

401

24 fluidounces water first solution — 12 ounces water in second solution — Column 1 gives name of salt. 2 The best Chemical solution grain of article dissolved in: second solution 3 The amount in No 2 sol put in No 1 (in fluidrachm.)

1	2	3	
Sulphate iron	Hydrochloric	8	Vague
"	Hydrosulph Amm	8	Intense black —

Get Resis. of Iodine paper moved 3 inches per sec. to prevent the I from insulating the pen. See if the resistance does decrease as battery increases.

Make 'Little's' solution
12 Water
4 Sal. Chl. Cal.
2 Sal. Sol. Ferrocyanide Pot.
add Chromic ac. till assumes sherry colour
then add 50 part Chl. Sod.

Trys in place of Fuchs. Sol.
5 ℥ Ferrocyanide Pot.
15 ℥ Water
10 ℥ Chl. Sod.
a little H Cl

CAUGHT IN THE ACT.

GERMAN CHARACTER SKETCHES.—[See Next Page.]

Result.

Result

Result. wd this solution bget a light blue paper & a dark blue mark with an Iron pen but it does not come out for a short time. No better with excess of either.
On this sol. throws a blue precip with sulph of Iron, added some sulph ac but no better results.

Boiled Logwood Solution

Nitrat Ammon. Nickel dark Sen
~~Lobb~~ Tin Violet Sen
Copper - dark Sen
Plain with 2mo Red

a addition of little aqua Ammonia darken the pap but increase sensation pap probably by redness Result 1 Cell - Nickel 1st Copper 2nd 2mo 3rd in Sensation with Excess aqua Ammonia.

2
Log - Sul Soda - Tin Copper Silver Nickel Copper Most sensation, addition Permanganate Pot. Colors pap deep Nickel + Copper only. Not any sensation

3
Log. Chl Ammonium - no metal Except Tin gives Color, purple sensation Pap light yellow to same add Chl Sodium period: after whole Solution Tin gives very light purple Mark while Other Metal except Platina gives a mark that Black + to Coffee Dont Come out for first instant, later, due to Iron underneath by melting new slip + ~~Rem~~ Connection all pens to Zinc get that purple Mark on nearly all pens but it quickly fade: quite sensative, Wont do it on Platina Base but on Tin foil Base.

Log - Sulphate Sodium - Chl Sodium
~~Hydr~~ Nitric Acid Ink pen Yellow paper
- Purple Marks with ink pen only
first imperceptible but comes out more
sensitive than ground. 1 Cell through
10 000 ohms - ——— ——— Cu ground

Log - Sul Manganese Copper pen - Mdly
Sensitive,

Worked all night
— 6 to 12

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Experiments with the new fuse
Chem Decomp moving a fuse - April 10-74

Removing a current does not help it a bit
with Potassic Hydrate.

Potassic Hydrate in paste rather dry ok -
~~Fuse~~ fuse Zincic Chloride increases friction
when hydrogen evolved on lead, very strong
but probably not so strong as hydrogen
reducing fraction with Potassic Hydrate.

Silicic Hydrate acid, increases friction when
hydrogen is evolved, probably more noticeable
than with Zincic Chl.
Oxygen appears to produce no effect
in either.

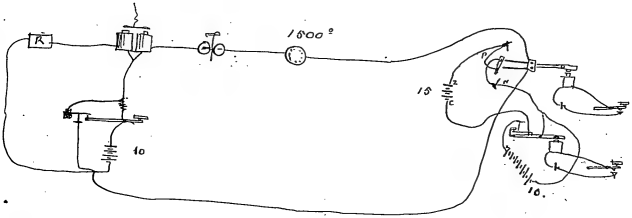
Hydrated Silicic Acid & Potassic Hydrate
Hydrogen decreases friction not so strong as
without hydrate Silicic A apparently

Sodic Phosphate, H dec fric - not very
good

~~Ammonic Chloride - very poor if any thing
in either~~

Mercuric Sulphate, the hydrate Ammonic Chloride in it
increases friction greatly
with O decreases a little with H

Mercuric Nitric - not so good acts both
ways like Mercuric Sul


K
1600°
10
15
10.

200,000
112,000
560,000
30 87,20000

Each 4 of us own 25 in 100.
~~[illegible]~~ 20 parts of hundred
leaving. Each 20 parts on 100
Recd 12000, for my 5 of 25
Meaning 4 have made to be worked
for double. That is 20000 & 5

112,000.

100.

112
5
560,000
1

Laboratory Notebook, Cat. 1170

This notebook covers the period November 1873-December 1877. Most of the laboratory notes and drawings are by Charles Batchelor; a few are by Edison. The material relates primarily to batteries, induction coils, and telegraphy. There is also a list of basic scientific questions, ranging from Newton's law of gravitation to atomic theory. The book also contains numerous accounts and lists of prices, stock, and hours worked. The flyleaf is labeled "Experimental Researches." The book contains 74 numbered pages, followed by 11 unnumbered leaves. Some leaves have been torn out.

Blank pages not filmed: 18-19, 24-25, 34-49, 52-53, 56-57, 60-69, 72-73.

Missing pages: 27-28.

Induction Balances

Telephone with the arc

7

Experimental researches.

Batteries. Page 1. Condensers 20.

A B C D E F G H I K L M N O P Q R S T U V W Y Z

Induction Coils 10

I K L M N O P Q R S T U V W Y Z

Perforatori pacco 8

N
O
P
Q
R
S
T
U
V
W
Y
Z

Solution Chemical Electro. 20

R
S
T
U
V
W
Y
Z

Common Cell, Battery Experiments. Bradley Galvanometer.
Carbon. Closed circuit all time

1872. ½ Carbon Cell
1 Outside Water
Inside Water

Deflection	1	2	3	4
Nov 27. 10.25 AM.	17	5	1	—
28 8 PM	19½	5½	1½	—

Outside Water & 1 spoonfull of Hydrofluoric Acid.
Inside Water 32 Nitrate Ac 4

		1	2	3	4
Nov 27	10.45 AM	37½	27½	23	14
28	8 PM	26	27½	36	7

3 Outside Water
Inside Electropoion

		1	2	3	4
Nov 27	10.15 AM	69	76	73	34½
28	8 PM	27	37	43	12

Outside Water 100 Hydrosulph. 3
Inside Water 32 Liqf Litha ½ g

		1	2	3	4
Nov 27	10.45 AM	26	20½	11	1½
28	8 PM	11	9	6	1

Outside Water 100 Hydro Sulph. 5
Inside Water 32 Chl. Cal ½ g

		1	2	3	4
Nov 27	10.25 am	52	36	33	6
28	8 Pm	39	28	10	1

Outside Water 100 Hydro Sulph 5
Inside Water Ac ½ g Malt 32

		1	2	3	4
Nov 27	10.25 a m	35	26	13	2
28	8 Pm	19	15	6	1

	Quicksilver	Water	10	Hydrochloric Acid	5		
	Sulphuric	HO_{32}		Sulph. Cy.			
					1	2	3	4
Nov 27			10 36 am		57	52	41	8
28			8 Pm am		46	41	25	5

1874 May 9.

I found that when I put bichromate crystals into the porous & then poured water & written a 4 inch of top & adding sulphuric acid the battery seemed a great deal stronger.

1875

April 10th

Ordinary Electroposition in porous cup & water outside with iron outside & Cadmium inside makes a good battery

Résumé of different Batteries

	Battery	Composed of: Resistance	Outer cell	Inner cell	Electrode: Outer cell	Electrode: Inner cell	E.M.F.	Chemical Action. Zn combines with O	Remarks.
1	Daniels	Dilute Sulp	Zinc	Sat. Sol. Sulph Cop.	Zinc	Copper			

Repairator prices I intend to give

1873 April 11th

1	Planing base & bar	
2	Drilling & tapping & fitting on Repair top bar & boring plug holes in cast & Countersinking rock shaft holes.	3.50
3	2 Key Shafts ex 20 cwt to be straightened filed to gauge, collars fitted, pinned & finished. Complete	4.00
4	28 Keys ex 54 Cycle & issue face both sides Slot Cross cut Issue down 2 keys in rock shaft	1.54
5	1 Rock shaft Starting Cams 34 p.m. Milling 3 slots 74 " " Filling 135 " " 98 at 235 p.m.	6.6
	Planing plough Filing to gauge Squaring on arms Drill & pinning arms Filling in base Filling in tailstock, rotating head & collars & numbering	1.40

1	Rotating head Filing to gauge Drilling & tapping Slots cross & spline Trimmed	1.10
	1 Main Bevel gears 1 Pair tailstock assembled complete	2.00
1	Punch head Back plate 33 Bar 1.11 Posts .15 2 levers .18 .10 Clasp .20 Fulcrum .10 Lever cast 3.60 Lever cut .15 Lever cut 4.00	10.13
1	Bar & slots Slots cross cut & turned 2.00 Mean 2 mean slots 25 p. 100	1.10
	Pedestal Base 3.25 Cross cut 3.25 Cross & long 2.25 Slot .5 Cross mean & cast 2.5 Pedestal cut .15 Cross mean 1.00	2.40

	Cam bar 28 at 4.35	4.3
	Cut off pins 3p Sockets " " 5p Slots " " 25 Cross " " 25 Key file 1 " 1.50	
10	Tunnel bar Cast	1.36
	Cut off pin 1.0 Sockets " 5p Straight .5 Slots .25 Cut slots 1.50 Punching ends 1.00 Cross 4.00 Cut off slots Punch ends 5.00	
	1 Rock shaft 28 ft. turn turn 28 at 2.25 p.m.	5
	28 Cross cut 1.5 Cutting ft. cross 28 at 2.25 p.m.	1
	2 Hooks	5
	Reading cross cracks	10
	Polishing Cam cut off per 100 Punch cut 2 " " Rock shaft 2.5 " " 17 Screws 25 p " "	1.12

	Screw Machine 2 Key shaft collars cut off ends & trimmed cast 1.5	0.2
	Knobs cross & cut up at 1½p	0.3
	Rock shaft Cut off & ends	0½
	3 Cross	0.3
	Examine & numbering 28 Cams 40 p. at 1.5	12
	Rock head	18
	Cut off ends & punch 2 hooks 200 p.c 11 c. ends 250 p.c 11 Punch ends 150 p.c	
	Rock bar 1 screw complete with nuts 1½	0.3
	Upper feed Cut off & ends shaft 600 p.c Cross cut hole top 1.5 p.c	0.3½
	Screw cross screw Cut off chilled & trimmed 300 p.c Nut 3.5 p.c	
	28 Cam bar Cut at 60 p.c	14

25 Fine [illegible]	.95		
Lumpers 60 p.c.		Iron Cast at	
Cut Slab net 40 p.c.		Iron Cast at	
Crane Pieces 20 p.c.		Bookseller at	
		Blacksmith at	
56 Pieces mixed		Blacking Rubber	
7 Slipped at 100 p.c.	.07	Tree	
		Tree	
1 Fr. Pieces 50 p.c.	0	Pieces	
14 Fr. Pieces 40 p.c.	1		
34 Shoulder Pieces p.c.	.23		
27 Fr. " " 40 p.c.	.20		
2 Fr. Pieces 15 p.c. discount	.02		
Freight: 7 miles cart			
Lumping			

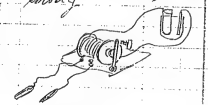
Induction Coils experiments

1874

Apl 18. Wound spool for single current to be made
1 & hole quick of Iron wire. Got shock but not very strong. Life of oth. relay spool

2  Wound 3 layers sounder wire next to core & fine Iron wire over it & felt it very good shock from Carbon battery

3 Made Coil longer & put 4 layers sounder wire on & filled up with fine Iron wire spool being about 5" long. & weighing about 4 lb.
Made battery out of an old glass jar & put a piece of sheet zinc & small piece of Carbon
The induction from this arrangement was very strong.



Apl. 26 Made Coil like following:

4 layers of Register wire & then fill up with 36 Iron wire & then boiled in paraffine for about ½ hour.
Boiling in Paraffine almost doubles the strength.
Core made of pieces of iron wire instead of solid is much better. glass here ought to be lots of surface in the handles. Small Carbon battery
Other works first rate.

Bad 2.
1 Domestic Box
1 " Recorder
1 Back Point Relay
8 Rolls Sodiac paper

Gilliland & Co in Acc with T. A. Edison

1 Punch & die	2	50	5 Castings at 10¢		50¢
1/2 g Alcohol 25¢		18	2 Vises Punch etc	13	68
1 British dog	2		1½ Wrought iron }		18
3 bolt washers		10	1/4 do do }		
1 Reuse iron 9 lb plane m			1 Bbl Charcoal		60
both sides	11		10½ lb Steel 20	2	10
1 Small self feed S. M.	4	50 00	1 Small chuck Wrenches		50¢
1 Die Holder for S. M.	1	100	1½ round Steel		24
1 Die Holder for do		10	1 big drills chuck	1	12
1 Die Holder for do		10	1 Split chuck for S. M.		
1 Tap Holder for do	8	70	1 Drill Jig ———	2	50
1 Stop for large Machine		50¢	2 lb Electrolyzer		10
1 cut of V former tool for			2 Jewelers ~~saws~~ gil		75
Small S. M.		30¢	6 Dies Lenman		1
1 Die Holder for S. M. Large		12	2 Punches "		1
1 Small hollow Mill	50	12	1 Spring for V & D Gill		2
30 iron Wire at 12¢	3	60	45 Brass pipe 4¢		3
5 lb Steel porous pot			Entered H. C. B.		
4 25 thm Spools long	6	00	1 Double spindle drill		X
1½ lb Sheet steel 22	2	47	Press "		
2 " round steel 16		32¢	1 Stove		
1 " " "		16¢	1 Core Box tool		
5 new rubber magnet heads		20¢	with 2 cutters		
1½ letter punch		33¢	1 Core tool blocked		
1 Centerpunch drill for S. M.		50¢	out		
1 stop for large S. M.		50¢	1 Half finished former		
1 Chuck for Screw Machine	1	10	———		
1½ reamer	1	2	1 Chuck wrench over		
1 large double box tool			192 Bottles for Battery		
for large Machine	1	20	23 36 lb gas Pipe		
1½ reamer		2.50	25 14 lb " "		
2 die holder for small S. M.	1	10	" 282 lb 1¾ Anaconda tubing		
1 long Hollow Mill		50¢	" 6½ lb 5/16 " "		
1 Tool for rasping stock		50¢	27 1 Box tool		35
2 Tap Holders for small S. M.		8	" 1 Lowerer	2	50
2 formers for small S. M.		40	3 Small chucks		50

18			One Batch Punches		
Bus			Clamps	5	00
			1 Small bolster	2	30
"	21st		2 Cutters 7/16 broad 1⅝ diam		
				3	25
			1 Bevil cutter 1⅝ x ¼	2	80
			2 2nd Saws		65
			1 2nd Saw old		30
			3 long gas pipes 7/16		
Oct 23			7 Extensions with Burners		
"			~~2 cutters 1/16 diam 7/16 broad~~		
30			The Batch cutter	5	00
			3 lb iron		
Nov	1		10 " "		
"			2 Vises		
"			1 2 Pulleys 12"		
			33¢ Stove pipe		
			30¢ Gas pipe		
			O. H. True Batchelor.		
"			4 1 lb glue		
"			" 9½ lb Emery		
"			" 10 " iron		
"			6 1 lb Glue		
"			" 5 rolls paper		
"			4 1¾ Screw M. Steel chuck		
			O. C. Batchelor		
"			12 4 lb Steel		
"			12 1 Bbl Charcoal		
			12 10 lb Castor oil		
"			Castings for Pans		50¢
"			5 lb Quick silver		
"			8 Rolls Lonsetto paper		
"			16 17 ft 2½ in belt old		
"			12 12 in Rubber hose		
			17 74 Anaconda 5/16 rubber hose		

Time on Machinery

		Hours
Oct 13th	Drill Press	8
" 15	" "	2
	Planer	120
" 16	Edging Machine	5
" 18	" "	10
" 19	" "	10
20	" "	10
21	" "	10
22	" "	3
" 23	Pd W. planer	7
24	Small Index machine	3
26	Shaper	2
27	Pd W. planer	9
28	Shaper	2
28	Pd W. planer	5

Work done for Edison up to Nov 1st

~~3 domestic bodies~~	~~85~~
~~3 Patterns for Bodies~~	~~10~~
" " Battery	~~11~~
2 Domestic bodies	29
O. H. True Batchelor	
Nov 5th Patterns for Battery	21
Cutters	14
Assembling batteries	27
O. H. True Batchelor	62
Nov 1st Engine Lathe	12
" 2 planers	10
2 " "	10
3 " "	10
4 " "	10
6 " "	9
8 planer	5
" 2 planers	10
" 2 planers	10

Nov 12	John Krusie for Gillet's Machine	
	Cutting Machine	25
	Patterns for Pen Moulds	25
	Boy Tom —	5
	J. Adams	5
Nov 19	Tom	5
" "	Boy cutting paper	2

Nov 19	Edging Machine	30
19th	2 planers	60
19th	Engine	20
19	Pens Letter	4
19	Engine "	10
Nov 26	Edging Machine	6
14th to 30th	Stewart Letter	240
" 21st	Engine Letter	30
14th to 30	Fitchburg Letter	150
Dec 3	Pt W. Planer	4
Dec 14	to Dec 31st	
	Washburne Letter	25
	Fitchburg Letter	
	Stewart	150
	Drill press	36
Jany 8th	Hand Letter	60
	Washburne "	20
	Edging Machine	11
8	Washburne "	30
10	Planer	2

Stock

	Week Ending Nov 25th	
Nov 26	1 Gallon Fluid	1000
	2 lb Glass jars	80
" 29	4 lb Pen Boxes	
	62 Rollers	
	10 Distributing Boxes	
" 29	12 Rolls Iodion	144
	Week Ending Dec 4th	
	Co Tomslick Sulphate Copper	
	Iodide Potass	$2 50
	1 Box Envelopes	
Dec 11th	20 Pens at	$3 00
" 15	26 Pens at	3 40
	Iodide Potash	1 00
	1 Jar for fluid	1 00
" 20th	50 lb Glycerine	
	1 lb Amilic Violet	
	12 Bottles for Ink	
Jany 17th	1 Iron Ink roller	
	2 hours work	
	1½ lb Wrought Iron	
	1 large Glass jar	
	for Conduit v Hanson	
	Battery	
Jany 28	18 Pen Screw drivers	
	6 Pen Cards Soldering	

	Week Ending Jany Feb 5th	
		Hours
	Chas Worth	68
	John Krusie	12
	John Ott	8
	Jim Egan —	10
	Feb 12th	
	Chas Worth	70
	John Krusie	13
	John Ott	43
	Jim Egan	20
	Tom Gardiner	13
	Feb 20th	
	Chas Worth	65
	John Krusie	3
	John Ott	43½
	Jim Egan	10

Recd from Gilliland & Co 1874

Autographic Press
Parts

			No
Sept 24		Rollers	3
Oct	4	"	1
"	8	"	2
"	8	"	3
"	9	"	2
"	11	"	5
"	23	Presses	2 27.29
"	"	Rollers	4
"	30	Presses	9–50.39.53.32
		42.38.67.57.83	
Nov	1	Keys	34
	5	Key	1
		Rollers	51
	7	Presses	5–89.24
		27.63.42	
Nov	1st	Kreuis Battery	10
"	10	Battery	7
	11	"	2
	11	"	3
"	12	Dot Boxes	3
"	"	Bottles Ink	2
"	13	Gotrub Boxes	7
"	"	Presses	4
"	"	Batteries	9
"	15	Bottles Ink	3

Solutions for Chemical Telegraphy

Solution	Symbol	Color of paper pen	Mark	1 Cuf Carbon. Base Value	Per annum	Per Cent	Price per cwt	Chem. Action
Potassium Iodide (K.I.)		White	Pot.	100	90	C.	100	
Pyrogallic Acid & Salt.		Grey	Pot.		40	Z	10	

Recd from Wurth or Shop

	Pens	5
	Pens	10
Oct	6 Pens	20
"	6 Pen Boxes	100
"	25 Pens	5
Nov	5 Pens	20

E. H. Johnson

Oct 13th one Press complete
with Agents Box
J. W. Painter
W. S. Express co
Cleveland O,

B. F. Johnson

Press complete not paid
Oct 11 " " without Battery C. O. D
" " T. B. A. David
4th Ave & Wood St
Pittsburg Pa 1 C. O. D
" " B. F. Johnson 1 C. O. D.
" " Lathaven & Thomond
40 Mx 3d St. Philadelphia 1 C. O. D.
Oct 19 one Press, roller
& Ink Box which to be
returned
" 25 Morris & Smith
15 South 3d St Phil
27 1 Roller & 1 Bottle blue ink
Nov 5 one Press complete & Inks & Tools
244 Chesnut St Philadelphia
" & one Autograph Press complete
Chas. H. Garrigues
43 South Front St Phil
Nov 9th one Extra hooding cup

E. H. Johnson

Oct 13th one Press complete
with Agents Box
J. W. Palmer
W. S. Express co
Cleveland O,

B. F. Johnson

Press complete not paid
Oct 11 " " without Battery C. O. D.
" " L. B. A. David
5th Ave & Wood St
Pittsburg Pa 1 C. O. D.
" " B. F. Johnson 1 C. O. D.
" " Bethavens Thumond
40 Dry 3d St. Philadelphia 1 C. O. D.
Oct 19 one Press, roller
& Box — Box thus to be
returned
" 25 Morris & Smith
15 Fourth & St Phil
27 1 Roller & 1 Bottle blue ink
Nov 5 One Press complete & Sponge & Tin
241 Chesnut St Phil Philadelphia
" 8 One Autograph Press Complete
Chas. F. Garrigues
43 South Front St Phil
Nov 9th One Extra Forming Cup

Condensers.

~~Nov 7~~
Oct 15th 76
1 Press Complete without battery for Patent office
Nov 7 one Autographic Complete to Mr. T. A. Edison

Press to Agents

J. S. Guilterlin
103 Waverly Place
N. Y.

Oct 15th
Press complete / O.A.D

Blemmerhasset & Edison

Nov. 5. 1 Press complete

" 4. one O. Press complete
S. Fingat & Sons 1411 Chestnutt St Philadelphia Pa

presses Sent to Millers

Nov. 5 2 Presses without Battery or Pons
2 Extra bottles blue ink
" 11 One Pen for above Press
" 11 2 Presses
" 9 1 " Newark O.K.
" " 1 " Philadelphia
" " 1 " Boston
" 15 1 " Newark
" 16 5 " New York

1 Enchain Newton's law of gravitation.

2 What is Avogardo's or Ampere's molecular theory?

3 What is the molecular condition of the three states of matter gas, liquid, + solid?

4 What is about the size + weight of a molecule?

5 What is meant by chemical combination?
6 " Analysis?
7 " Synthesis?
8 " the Atomic theory?

9 What is the theory of combustion?

10 What are Alkalis & Acids?

11 Describe the Barometer?
12 Describe the Hygrometer?
13 What is an Anemometer?
14 What is the meaning of "inversely proportional to"?

15 What are the laws of Mariotte?
16 " " " " Charles

J. T. Murray in Co with T. A. Edison

Aug 18th	6 Self Winder belts	1 Punch & die for nuts
" 26	6 rolls Domestic paper	1 Brass base for U.P.
30	2 sets of Alphabet U.P.	100 feed Click shoulder screws
" 6	letters for U.P.	10 Bind posts half finished
Sept 4	1 Die Holder	15 Keepers
	1 reamer for big holes in base	25 Magnet screws
	1 Plg lever drill jig	172 Type wheel nuts
	1 Plg lever " "	40 " " half finished
	1 Drill jig for Extra escapement	16 " " levers
	3 large base jig drills	40 cores
	1 Base jig for extra hole	20 Armatures for U.P.
	1 T piece file jig	6 long magnet sticks iron
	1 V piece drill jig	3 short do do
	1 V " file jig	3 short Brass do do
	1 Crook piece drill jig	1 long do do do
	1 Paper reel arm drill jig	2 " " " "
	1 Plg lever sho. drill jig	1 jig Perforator drilling Jew Harp in Cross bars
	1 Upright Drill jig	300 Stage pieces
	1 " file jig	300 " Clicks
	1 Ink roller guide drill G	300 Uprights
	1 Unison lever drill jig	300 Unison bippers
	1 Stage click drill jig	300 V pieces
	1 Ink roller arm drill G	35 U.P. Type wheels
	1 Stage click file jig	1 drill jig for Magnets sticks
	1 Extra escapement lever file jig	2 Punches V & die for Perforator
	1 Armature drill jig	5 lb Brass castings
	1 Unison arm file jig	8 " " "
	1 Upright file jig	27 Crook pieces
	1 Crook piece file jig	20 lb iron rod
	2 bipper file jig	4 small cutters
	1 T piece drill jig	1 die Holder
	1 Link file jig	2 flask of nit Acid
	1 Feed Click file jig	1 Punch & die for Printing lever
	1 pair Plg lever jaws	1 drill jig for Upright piece
	25 Adjustment pins	milling gab for Escapement lever and Mill for same

		2 jaws for paper reel
		2 milling jaws small
		1 square punch for nuts
		1 Punch & die for Unison arm
		1 file jig Printing lever
		1 die for Escapement lever
		1 Upright Punch & die
		1 Trippers " "
		1 T piece Punch & die
		1 Punch & die Extra
		1 Punch & die for Stage click
		1 " " for Length
		3 dies for ink roller Arms
		1 Small milling jaws for click
		1 Punch for Crook pieces
		1 Punch & die for Stage pieces
		1 milling jaws for Stage "
Nov 5th		12 Adjusting pins
" "		4 lb of hard rubber
" "		6 Printing lever Armatures
" 17		1 lb Brass
17		60.48 shoulder screws
18		55 Adjusting pins
Dec 14		4 Iron brackets
" 20		50 Adjusting pins
22		6 Links for Governor
"		3 Printing levers
24		50 Small Relay Armatures
Jan 30		4 Governor Cross pieces
5		1 " ball

Recd from J. M. Murray

Nov. 1st 1 doz receiving pens
" ~~2 do Debenturing pens~~
" " 1/4 lb Ink rubber

Domestic Tel. Co Newark

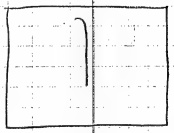
Nov 12	4	Rolls Iodide
Nov 29	12	Rolls Iodide
Dec 18	15	Rolls Iodide
Jan 14	15	Rolls Iodide
Feb 23	22	Rolls Iodide
" 27	20	" "

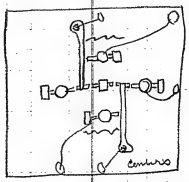
Domestic Tel. Co N. Y.

Nov 8	12	Rolls Iodide
Nov 20	12	Rolls Domestic
Dec 18	12	Rolls Iodide
" 29	22	Rolls Iodide
	12	Rolls Iodide
	12	Rolls Iodide
Feb 27	12	Roll "

Jany Reed 1 Bbl Kerosene Jany 8th 1877

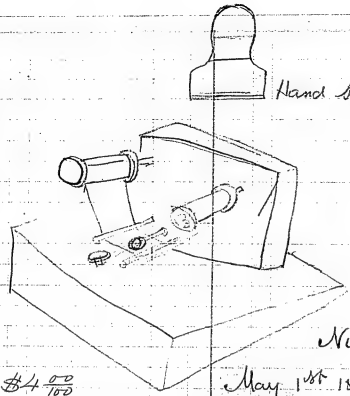
Jany 9th	Edisons House gal	5
12	Shop	2
13	Charles Edison	1
15	Edisons House	5
13	Adams	1
15	Shop	2
16	Krusi	1
17	Shop	2
20	Chas Edison	1
22	Shop	2½
23	Edisons House	5
23	Adams	1
24	Shop	2
26	"	2
30	"	2





$7 50/100

No 20
Ans 30th 1877



Hand Stamp

No 21

$4 00/100

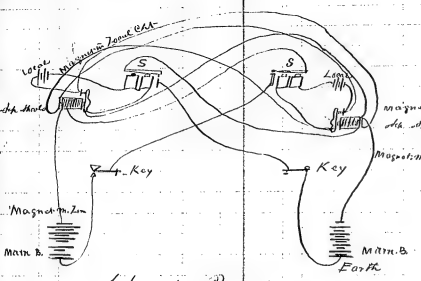
May 1st 1877

Mfg'd for fuing Speebscope
No. 22

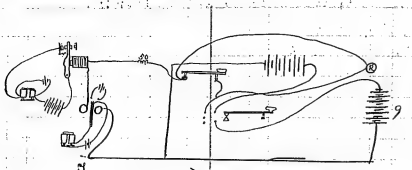
$2 00/100

Russell's time Dec 1877
(HEN Mar 1966)
See original time sheets in
Box File 1877 - Phonograph

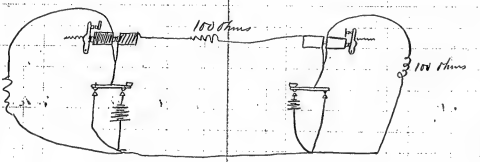
Dec 1	Phonograph	10	Tim	
2	"	10		
3	" & Bromson	9		
4	"	13		Cash to Edison $3 00/100
5	"	13		
6	"	15		
7	" Patent-office model	10		
8	" "	8		
9	Phonograph	4		
10	"	9		
11	"	10		
12	"	10		
13	"	10		
14	"	10		
15	"	10		
16	Telephone	11		
17	"	10		
18	Phonograph	12	184	
			185	
19	"	5		
20	"	13		
21	"	10		
22	"	9		
23	"	7		
24	"	9		
26	"	9		
27	"	10		
28	"	13		
29	"	10		Cash to Edison 6 00/100
30	"	8		
31	"	9		Alexander Mellook gave $2 00/100
			112	



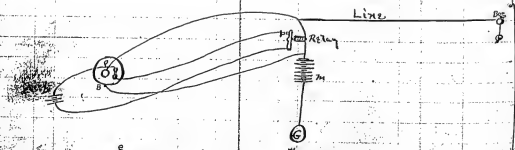
Automatic Repeater



Two messages in one direction



Duplex J. G.



Domestic Messenger Telegraph

To Make a bichromate Solution

5 gals. Water.
5 lbs bichromate broken fine
1.5 lbs Sulphuric acid

---

6 g. — SO_3
20 " HO
2 " $KO\ CrO_3$

Telephones for Mr James New York

No 11 transmitter has got Hotchkiss flirt
" 13 " " "

No 12 & 16 has got Hotchkiss Poodle Pocket
[illegible] of Globe [illegible] telephone
8.80 M. G.

Laboratory Scrapbook, Cat. 1168

This scrapbook covers the period February 1874-January 1876. The laboratory notes and drawings glued into the book are primarily by Edison and Charles Batchelor and relate to telegraphy. There are also paper-strip recordings of musical tones and the human voice. The book also contains many clippings about the telegraph industry, including several large cartoons depicting the Western Union monopoly and the power of Jay Gould, as well as other clippings dealing with matters of technological, scientific, and economic concern. Business-related material includes forms, price lists, and a service map of the Domestic Telegraph Co.; a price list from George Wale & Co., philosophical instrument makers; and advertising circulars. The cover is marked "Vol P."

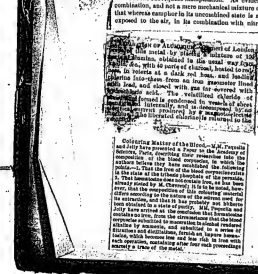
The book contains 62 numbered pages followed by many unnumbered leaves, all but one of which are blank. Several leaves have been removed from the middle of the volume.

Blank pages not filmed: 53-54, 61-62.

CHEMISTRY

SCRAPS.

Index.



CELLULOID—A NEW AND IMPORTANT INDUSTRIAL MATERIAL.

About eleven years since, Messrs. Phelan & Collender, of this city, offered a large premium for the invention of a substitute for ivory for billiard-balls. The offer having come to the notice of Mr. J. W. Hyatt, then a resident of Albany, N. Y., this gentleman set to work to discover a substance which should possess the required qualities. He manufactured various compounds, one of which was found to be sufficiently strong and elastic, but the surface was not sufficiently fine and the color was bad. This compound was a mixture of shellac and paper-pulp, combined by a new process, the same now used by the Hyatt Billiard-Ball Company, at Albany, for the manufacture of billiard-balls.

In searching for some solution to fill up the pores of this material and qualify it to receive a fine polish, Mr. Hyatt's attention was called to collodion. Alexander Parkes and some others had, at least eighteen years ago, made use of this material, but Mr. Hyatt was not aware of this fact at the time of his first experiments. Those who employed soluble cotton, previous to Mr. Hyatt's experiments, made it into a pasty mass by the use of ether and alcohol. They first made a thin solution like that employed by photographers. Then they gradually reduced it to the consistency of paste by introducing more and more of the cotton; and, finally, they reduced it to the consistency of dough by evaporating off a portion of the solvents. But here difficulties presented themselves, for, if it be attempted to add more of the soluble cotton to a thick paste of collodion, the cotton will not dissolve nor soften. A large percentage of the fibres retain their original condition, and the result is a material not homogeneous and more or less friable. It is as though so much fibre were mixed with the pasty collodion. The reason of this is that the mixture of ether and alcohol only penetrates the particles of the soluble cotton before the solution has reached that point of saturation which much reduces its fluidity. It is also found that in reducing the collodion from a pasty condition to a solid, the bulk of the mixture is decreased three-fourths and sometimes even more, and when the consistency of dough is reached, which is as low as the material can be mixed and have the particles weld, from that point to the point of absolute dryness the decrease in the bulk is more than one-half. It follows that the coatings put on the billiard-balls, which are about a quarter of an inch thick at first, when they become solid and are turned down, are less than a sixteenth of an inch in thickness. Moreover, the quality of the cotton has to be very perfect, or the material will be extremely brittle when prepared by a liquid solvent. Obviously, the material thus prepared is fit for very few uses, except as a coating for billiard-balls, for which it is admirably adapted; it is too expensive, and there are too many difficulties in working it.

In 1868 and 1869, Mr. I. S. Hyatt, a brother of Mr. J. W. Hyatt, interested himself in the problem, and together these gentlemen conceived the idea of employing mechanical means in order to enable them to use the minimum amount of solvents for any proportion of soluble cotton. They first succeeded in this attempt by putting the cotton into a close, strong cylinder, exhausting the atmospheric air, and forcing a mixture of alcohol and ether through the mass instantly, by great pressure, so that it would penetrate through all the particles of the cotton before the solvents had time to act upon it. The essential feature of this process is the rapidity with which the solvents are forced into the cylinder. If they are forced in slowly, a stratum upon the top is converted into a doughy mass, and through this the remaining liquid cannot be forced. While the soluble cotton remains still in a state of fibre, the mixed liquids must be injected suddenly and forcibly and held under pressure, and in two minutes' time the cotton can be removed from the cylinder as solid as oak-wood. This process was patented in 1869.

In the early part of 1870, the Messrs. Hyatt made numerous experiments, the purpose of which was to render more convenient the manipulation of large masses of material, and also to secure desirable qualities which did not exist in the solid collodion obtained by the process patented in 1869—viz., plasticity when heated, and the reduction of inflammability. Among other substances experimented with, camphor was mixed with the cotton. It had been known previously that a solution of camphor in alcohol was a solvent of soluble cotton. It was reasoned, therefore, that camphor might be mixed with the cotton at any stage of the process, and that upon the addition of alcohol the same result would be obtained as when alcohol is previously mixed with the camphor. In the first experiment of mixing the camphor with the wet pulp, while casually squeezing it with the hand, it was found that it compacted and showed signs of combination, although no alcohol had been added. This important discovery was the origin of the present manufacture of celluloid; for it was immediately found upon repeating the experiment that camphor alone was, under proper conditions, a perfect solvent of soluble cotton. In a very short time after the first experiment, a lump of solid celluloid was produced by heating the material to a temperature less than that necessary to melt solid camphor. It was, moreover, found that a perfect chemical combination of the two substances resulted, and the remarkable material now called celluloid was then produced.

The outline of the process now employed in the production of celluloid is as follows: After the pulp is ground in the beater-engine, and the camphor and whatever coloring material may be desired are thoroughly incorporated with it, the substance being kept meanwhile at the proper temperature, the superfluous water is removed by pressure and absorption, a peculiar porous material made specially for the latter purpose being employed. During the process of drying under pressure and absorption, the material becomes nearly converted, so that it is no longer nitro-cellulose, but imperfect celluloid. In so far as conversion has taken place, its properties have undergone a total change. All that remains to convert it into the various articles referred to is manipulation under heat and pressure, during which process the chemical combination is completed. For some qualities of the material desired to be produced, a small percentage of alcohol is added in the subsequent manipulation. As evidence that there is a perfect chemical combination, and not a mere mechanical mixture of the materials, the fact may be stated that whereas camphor in its uncombined state is an extremely volatile substance when exposed to the air, in its combination with nitro-cellulose it loses this property altogether. An enumeration of the properties of the material which we shall give anon will be further proof of the chemical combination. When the material is properly converted, comparatively no shrinkage takes place. There is no escape of the camphor unless an excess has been employed; and in that case the excess of camphor will escape from the surface of the celluloid, but whatever uncombined camphor remains in the interior is so closely imprisoned by the solid surfaces that it cannot escape. By varying the proportions of the excess of camphor, different degrees of solidity and flexibility are obtained.

The properties of celluloid are as follows: Without the admixture of coloring material, it has a pale amber color. If it is desired to make the material white like ivory, oxide of zinc is used, and for other colors various mineral pigments are incorporated with it, or dyes soluble in alcohol or any of the aniline dyes may be caused to permeate the material to give it any desired color. It is hard and elastic, having a hardness ranging from horn to that of ivory. It is as tough as whalebone. A thin piece like a paper-folder may be wound around the finger without breaking, and it will nearly resume its original shape when released. In fact, elasticity is one of the most prominent characteristics of the material. In this respect, it greatly exceeds ivory. On this account it would be extremely useful in the construction of apparatus for physical laboratories intended to illustrate the impact of elastic bodies. A ball two inches in diameter placed upon an anvil would require perhaps fifty blows from a heavy blacksmith's hammer to fracture it, and if the anvil and the hammer are both polished, not even a scratch or indentation can be found upon the ball previous to its breaking. By the use of the lathe for turning spheres invented by Mr. J. W. Hyatt, and described and illustrated in our last number, balls of this material can be produced with great facility, much cheaper than ivory balls and vastly nearer perfection. Celluloid is also a very fair non conductor of heat and electricity—not quite as much so as hard-rubber, but approximating the latter very closely in this particular. It would make good insulators for knobs of telegraph instruments, for insulating posts for electrical machines, and for telegraph wires. While it is so good a non-conductor, it is not perceptibly electric. On this account, and on account of its toughness, it is particularly adapted to the manufacture of combs. It does not acquire electricity when passed through the hair, and the teeth are with great difficulty broken. A comb made of this material may have several of its teeth cut out, and the remaining teeth may be bent flat down to the back, twisted and manipulated with the greatest rudeness, without breaking. As a material for combs, it is undoubtedly superior to any other yet used.

But perhaps the most remarkable property of this otherwise very remarkable material is the fact that it becomes plastic at a temperature of from 250° to 300°, and this property enables it to be moulded with facility into a great variety of forms for ornament and utility. Pure celluloid has a specific gravity of about 1.4.

A profitable and successful industry, based upon these properties of celluloid, is the manufacture of dental plates. The material can be made precisely the natural color of the palate and gums. It is much stronger than rubber, and has a perfectly clean surface. It may be manipulated more easily than rubber, as it does not require to be vulcanized. It possesses all the valuable qualities of rubber for dental purposes without its defects. It requires only about one-sixtieth as much vermilion to give the proper color to celluloid as is required to impart the usual color to rubber. The danger of salivation which sometimes occurs in the use of rubber for dental purposes is therefore obviated. The difficulties encountered in the application of celluloid to dental plates have been very great, and many failures were at first experienced, but, with untiring perseverance, the inventors have pursued the subject until, during the last year, they claim to have produced an article possessing all the requirements desired; not a single failure having been experienced through any fault of the material made within a twelve-month past. The editors of the *Dental Cosmos*, the foremost dental journal published in this country, fully corroborate the value of celluloid as a dental base, and many of its correspondents, leading dentists throughout the country, add their valuable testimony in its favor. The material seems adapted to a great many uses to which it has not yet been applied, but its applications are now sufficiently various to render it of great importance in the arts. It is used for handles for table cutlery, for martingale-rings, for coating harness trimmings in place of leather, rubber, etc., and in these applications is meeting with high favor. The Celluloid Novelty Company is the name of a large concern just starting in Newark for the manufacture of napkin-rings, ladies' necklaces, crosses, lockets, and other ornamental articles. The Celluloid Harness-trimming Company is the name of another extensive concern which has been successfully working for about a year in the same city. The articles produced by this establishment are elegant, and the martingale-rings have double the strength of ivory rings. Another establishment is manufacturing imitation coral and amber jewelry of celluloid. Penfield & Company, of Philadelphia, are manufacturing celluloid truss-pads and truss-springs coated with celluloid. These articles are of a flesh color, and the coatings are far superior to hard-rubber, being so elastic that the spring may be bent until it breaks before the covering will rupture. As it does not become brittle under extreme cold, like hard-rubber, there is no danger of its cracking when cold. A few samples of beautiful brush-backs have been made from celluloid. It may be run out into tubes of any required diameter and thickness. Watch-cases have been made from it, and are pronounced far superior to those made of hard-rubber. It is a valuable material for the manufacture of the tubes of opera-glasses and folding-telescopes. The Celluloid Manufacturing Company—also established at Newark, and with which the inventors are identified—are manufacturing large quantities of this material for the purposes named, and are also engaged in the manufacture of some of the articles enumerated. They are now preparing facilities for the extensive manufacture of combs, a branch of industry which they propose to make a specialty. Gen. Marshal Lefferts, of this city, is the president of the Company. We are promised specimens of celluloid, and articles made from it, which, when received, we shall be happy to show to any of our readers or clients who desire to investigate its character with a view to its employment in any new application. For some delicate parts of models, requiring great strength in proportion to size and weight, it would be excellent.

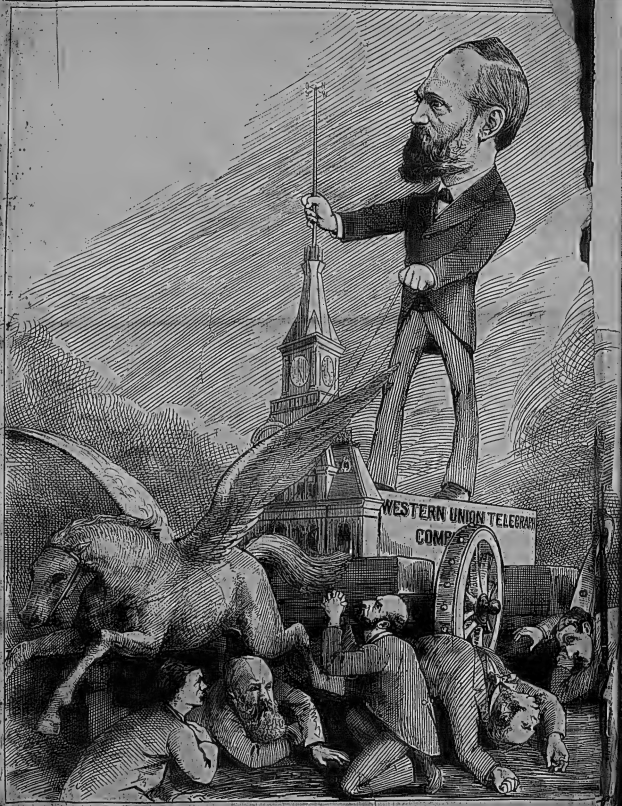
[illegible]ARATION OF ALUMINIUM.—[illegible] of London [illegible] this metal by placing a mixture of 100 [illegible] alumina, obtained in the usual way from [illegible], &c., with 40 parts of charcoal, heated to red[illegible], in retorts at a dark red heat, and leading chlorine into them from an iron gasometer lined with lead, and closed with gas tar covered with [illegible]chloric acid. The volatilized chloride of [illegible] formed is condensed in vessels of sheet [illegible] internally, and is decomposed by an electrical current produced by a magneto-electric machine. The liberated chlorine is returned to the [illegible]

Electric Railway Whistles.—The French have lately introduced a system by which a stationary electric battery is made subservient to blow the whistle of an approaching locomotive, in case the road is not clear, without the engineer having to give any attention to it. Such an arrangement is, of course, exceedingly valuable at night, and especially during a fog, when signals cannot be seen at a distance. It is the reverse of the system introduced on the Hudson river railroad, by which every approaching locomotive sets a stationary electro-magnetic alarm bell at the depot in motion. In the French system referred to, the obstruction at the depot starts the steam whistle on every approaching locomotive when the train is still far enough away to slacken speed and stop. It has now been in uninterrupted operation on the line of the Northern Company of France for some time, and has been found practically successful in use, regularly informing the engineer whether the way is clear or not. The signal man turns a disc and sends an electric current in the direction of the coming train to a bar placed between the rails; when the engine reaches the spot, a metal brush, placed between the wheels, sweeps the bar, the current passes to the engine, and, by means of an electro-magnet, presses upon a lever which opens the steam whistle, thus making it blow automatically. The rapidity with which the danger signal can be sent appears to be much in its favour.

Colouring Matter of the Blood.—MM. Paquelin and Jolly have presented a Paper to the Academy of Sciences, Paris, describing their researches into the composition of the blood corpuscles, in which the authors believe they have established the following points.—1. That the iron of the blood corpuscles exists in the state of the tribasic phosphate of the peroxide. 2. That hæmatosine does not contain iron, as has been already stated by M. Chevreul; it is to be noted, however, that the composition of this colouring material differs according to the nature of the solvent used for its extraction, and that it has probably not hitherto been obtained in a state of purity. MM. Paquelin and Jolly have arrived at the conclusion that hæmatosine contains no iron, from the circumstance that the blood corpuscles submitted to maceration in alcohol rendered alkaline by ammonia, and submitted to a series of filtrations and distillations, furnish an impure hæmatosine, which becomes less and less rich in iron with each operation, containing after four such proceedings scarcely a trace of the metal.

THE TRUE ZERO POINT OF THE CENTIGRADE THERMOMETER.—Dr. Craig, in a communication to *The American Chemist*, calls attention to the fact that the true zero point of the Centigrade, or 32° of the Fahrenheit scale, is not that of the freezing point of water, but the melting point of ice, and that water in which even a considerable quantity of ice is immersed is usually several degrees above this point. If, however, the bulb and stem be immersed in melting ice or snow, from which the water is draining off as it is produced, the mercury will attain the exact temperature desired. Dr. Craig further remarks that any vessel filled with damp snow will give correct results, if the instrument is driven down in the snow up to the 32° point, and a lens is placed on the top of the snow to read by, provided there is no accumulation of water about the bulb. He also refers to the fact that there is a gradual change in the scale of the thermometer with age, the reading becoming generally too high. This is due to the contraction which in time takes place in the bulb; although, occasionally, there may be temporary changes in the opposite direction.

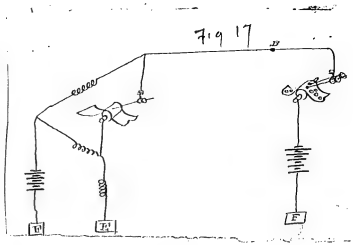
VOL. VI. All the News. Four Editions Daily. NEW YORK, SATURDAY, FEBRUARY 27, 1875.—TEN PAGES. $12 Per Single Co.

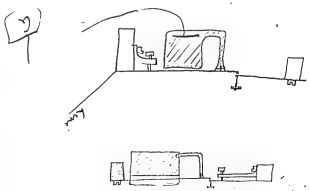


THE GREAT TELEGRAPH JUGGERNAUT.

HOW THE TELEGRAPH MONOPOLY TREATS ITS VICTIMS.

Fig 17





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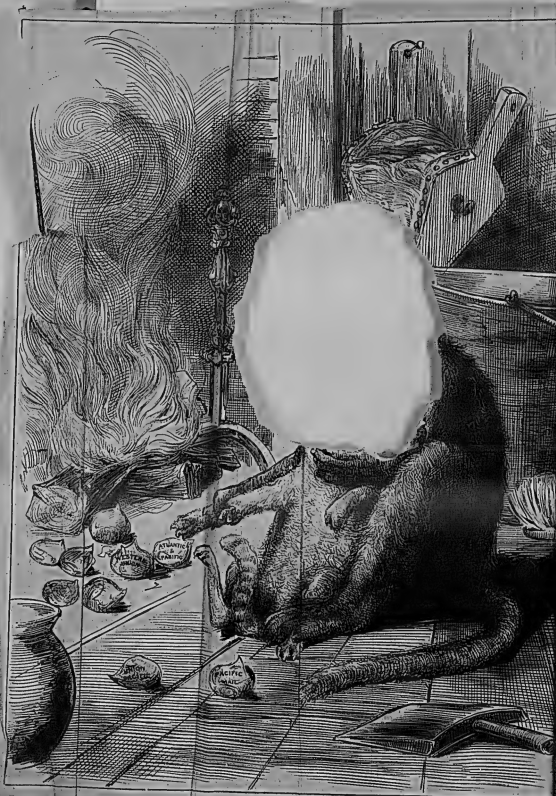

THE WILY MONKEY AND THE DELUDED CAT.

A wily monkey, named *Jackie Gould*, wishing to secure for himself some chestnuts that others had placed to be roasted, sent to the house of Jennings-Dawes-Reid: "o
[illegible] and pull out those nuts; I will reward you with [illegible] share of in the cupboard." Tabby did so, for she loved nuts. That same intent cunning key, however,
[illegible] Tabby's paw—which thus was nearly burned—Jackie pulled out the nuts. That same intent cunning key, however,
the [illegible] was one and nineteenpence. The cat, with Tabby's paw—which thus was nearly burned—Jackie pulled out the nuts. That same intent cunning key, however,
[illegible] Tabby who was the third, for she limped and [illegible] blisterwards, and everybody laughed when he thought of that bowl about the homeopathy of the owners of th

VOL. VII. All the News. Four Editions Daily. NEW YORK, WEDNESDAY, MARCH 24, 1875. $10 Per Annum. Single Copy

JUPITER AMMONOFOLY ORTON AND HIS VICTIM THE PRESS.

VOL. VII. | All the News. Four Editions Daily. | NEW YORK, WEDNESDAY, MARCH 31, 1875. | $12 Per Year in Advance. Single Copies, Five Cents. | NO. 642.

ST. JAY GOULD IN MONASTIC RETIREMENT.

"A mountain's out and
In search of Wall street's swell;
Patrons all his creed,
To sell the golden bead;

Move collectors on the end
Of Satan's Dotage, whilom his friend.
Thought takes he for wealthy spoons,
Man are covered all his "chunes."

Now in heavenly stock he "goes"
All his trust: "Old scrip has gone"
Nature many powers and "Erie" tone
Temperate, his words "a mid in lane.

THE DAILY GRAPHIC

FRIDAY, SEPTEMBER 17, 1875.

THE GREAT TELEGRAPH WAR.

THE AUTOMATIC SYSTEM AND CHEAP TELEGRAPHY ON LAND LINES—IMPENDING REVOLUTION IN THE TELEGRAPH BUSINESS—JAY GOULD'S IDEA OF THE NATURE OF A CONTRACT AND TRUST.

A short time ago it was announced that the Atlantic and Pacific Telegraph Company had purchased or obtained the control of the chemical automatic telegraph system, founded on the inventions of Mr. Edison and Mr. Little, and which system, it was claimed, had recently been perfected so that from three to five hundred words per minute were transmitted regularly over circuits of 250 miles.

It was confidently predicted that with this system the public would be enabled to send long messages by telegraph at very low rates.

It appears that the right of the Atlantic and Pacific Company to use this system is now denied. We have ascertained the facts of the case from the representative of the parties claiming the patent rights, and have at the same time obtained from him several interesting items of information respecting the automatic and other systems of telegraphy.

Formal notices have been served upon the directors and officers of the Atlantic and Pacific Comp[illegible] others, and circulated in printed form, to t[illegible] effect that the Atlantic and Pacific Company hav[illegible] to comply with the terms of the contract ent[illegible] with them for the sale to them of the said inve[illegible] they must discontinue the use of them. These no[illegible] having been given by Mr. R. W. Russell on behalf of the owners of the patents our reporter applied to him for an explanation of the matter, which he gave to the following effect:

A few months ago, an arrangement was entered into by Mr. Jay Gould on behalf of the Atlantic and Pacific, and Mr. Reiff and Mr. McManus on behalf of the owners of the patents for the sale of the latter to the company for a proportion of the capital stock of the Atlantic and Pacific.

In the expectation that this sale would be consummated, the Atlantic and Pacific were put in possession of the telegraph line from New York to Washington, which had been worked by the Automatic Telegraph Company, and were allowed to use the automatic system of telegraphy on all their lines, and they have continued to exercise that right up to this time. Deeds of transfer of the patents agreed to be sold were executed by Mr. George Harrington, in whose hands the patents were placed on behalf of Mr. Edison, and of Messrs. Reiff, McManus, and others who had supplied the funds for the development of the inventions. These deeds were put in the hands of Mr. Jay Gould, with written instructions to deliver them to the Atlantic and Pacific on payment of the consideration to the parties named in the instructions and in the shares and proportions therein specified. Mr. Harrington's name is in that list, and he sold to Mr. Gould the individual share of the proceeds coming to him (Harrington) under that sale, which was all that he could convey.

The Atlantic and Pacific now deny that they are bound by Mr. Gould's bargain with Mr. Reiff and Mr. McManus (which was confirmed by Mr. Harrington).

The Atlantic and Pacific are reported also to claim that Mr. Gould can give them all they want in disregard of the instructions accompanying [illegible] delivery of the deeds to him and without paying the consideration agreed upon. And furthermore they allege that the vendors have failed to perform a portion of the bargain relating to certain railroad contracts. That allegation is denied by the patent owners.

As to the claim said to have been set up that Mr. Gould has the legal title, Mr. Russell stated to our reporter that he did not believe such a claim had been advanced; that the transfers to the Atlantic and Pacific were wholly inoperative by reason of the failure to comply with the conditions upon the performance of which—and not before—those transfers were to take effect, and consequently that the owners of the patents can dispose of them to other parties.

Our reporter availed himself of the opportunity to elicit the following information:

Q. The President of the Western Union Company insists that the quadruplex system is better than the automatic, and he claims that the former system is owned or controlled by the Western Union. Do you consider those statements to be correct?

A. By the quadruplex they can make, as they say, one wire do the work of three. By the automatic one wire does the work of twenty or more. Very skilful operators are required for the quadruplex, but ordinary operators suffice for the automatic. The Western Union do not own the patents for the quadruplex; they are owned by the parties whom I represent. They would be very valuable if we had not got the automatic system. The Western Union are using the quadruplex with printing telegraph machinery quite successfully. Mr. Orton claims that the invention is of immense value to his company because of the saving of wires effected by it, and yet assumes that the greater saving of wires effected by the automatic system is of no consequence. He argues in that way because the Western Union have no claim of title to the automatic system but do set up a claim to the quadruplex. When Mr. Orton discovers that his company has no title to the quadruplex I think he will announce to the public that there are no real merits in that system.

Q. I understand that the Atlantic and Pacific Company promised to give the public cheap telegraphing with the automatic system. Do you consider they have finally abandoned that idea? They have recently revoked their action in reducing the tariff.

A. I do not know what the Atlantic and Pacific Company propose to do. They are now using the automatic system on their lines, but the parties interested in that system have no voice in the management of the affairs of the company. That system has in fact been placed in the hands of lukewarm friends. They might have used it to revolutionize the telegraph business, but have merely used it as an auxiliary on their routes where there is a deficiency of wires. And it has encountered the opposition of the skilled Morse operators, who, of course, do all they can to present the introduction of machinery to supersede their hand-work. The automatic system is of comparatively small value if the old telegraph companies desire to continue the telegraph business on the old basis—ten-word messages and high prices. But sooner or later the automatic system will be established to give the public the advantages both of long messages and low rates. Before long it will become a general practice for newspaper correspondents and others to prepare long messages on perforated paper to be sent to the telegraph offices to be run off by the automatic machinery at so much per 1,000 words. By no other system can the business be done in this way. Many parties are desirous of having the exclusive use of wires for private lines. The automatic system supersedes the necessity for private lines. As to way offices one will suffice for a great number of way offices. Each office being allowed the use of the wire at fixed periods for a few minutes can write off all its business. The operator is engaged in preparing his messages whilst the wire is being used at other offices. All the business of the country can be done by this system upon inexpensive lines, and the old companies will be unable to stand up against this competition. It is machinery against hand labor.

Q. Mr. Orton is reported to have said that his company could not be persuaded to use the automatic system; that it is inferior to the Morse system, and moreover that there is no novelty in the automatic system—that it is public property.

A. The courts are not likely to sustain that last proposition. More than fifty patents have been recently issued at Washington for improvements on the automatic system, all of which are owned or controlled by my clients. As to the comparative merits of the Morse and the automatic systems I may observe that I have for a long time past held that hand telegraphy would be superseded by automatic telegraphy. I often discussed the subject with Professor Morse, when we were together in the Board of Directors of the American Telegraph Company. I was the standing counsel of that company and a member of the Executive Committee of Three by which the business of the company was managed. It was mainly through my efforts that the consolidation of the Morse, House and Bain lines from Maine to Texas was effected. In the West I caused the Morse and House patents to be united and the Western Union Company was founded on that action, the nucleus being the New York and Mississippi Valley Printing Telegraph Company. The automatic system would, I think, have been established on the lines of the American Telegraph Company if I had remained on the Executive Committee. But as my policy in regard to the New York Associated Press was not sustained by the Board of Directors, and I was deserted by those who had agreed to act with me in breaking up the monopoly of that association, I became disgusted and left the destinies of the company to the control of others. Since that time I have repeatedly advised parties who were desirous of going into the telegraph business that the fortress already built was too strong to be successfully assailed until the assailants could perfect and control the automatic system. Professor House, the inventor of the printing telegraph, became convinced that automatic telegraphy would supersede all other systems, and consequently refused to continue his efforts to improve his printing telegraph, for which improvements I and my colleagues had paid him several thousand dollars. Professor Morse recognized the importance of the automatic system, [illegible] to its development and adoption. Before Mr. Orton took the presidency of the United States Telegraph Company, it was offered to me, and I declined on the ground that the automatic system was not then sufficiently developed [illegible] opposition to the Western Union Company. I considered that the great monopoly held by that company could not be subverted except by the introduction of the automatic system. Mr. Orton took the Presidency of the United States Company, and soon afterwards turned the concern over to the Western Union. I did not choose to be the medium of such a transaction. Subsequently Mr. Orton became the President of the Western Union.

Q. If the automatic system has the merits you claim for it, is it not strange that the Western Union have not tried to purchase the patents? What do you consider to be the special advantages of the automatic system over all others?

A. Some of the patents for the automatic system were for a considerable period controlled by Mr. Craig and other parties, who were so opposed to the Western Union that it would have been impossible for that company to acquire those patents. Hence the Western Union took the position that they were of no account. Having taken that position they have felt bound to adhere to it, and they have undertaken to magnify the importance of the quadruplex as a rival of the automatic. As to that rivalry you might as well compare a stage coach with a locomotive and train of cars. An operator who transmits a message by the Morse system which is used for the quadruplex has to touch the finger-key nearly four times to make each letter, and he must carefully distinguish each time the dot from the dash, allowing a longer time for the latter than the former. The operation is slow and the operator is of course liable to make mistakes, and so also is the operator who receives the message by sound. To send twenty words in a minute the operator must manipulate the keys six times in a second.

By the automatic system, instead of breaking and closing the circuit with a finger key worked by the hand of an operator, the pulsations are regulated by mechanical action, the speed of which is practically unlimited. The circuit has been broken and closed more than 70,000 times in a minute.

It is now the common practice to send from three to five hundred words per minute between New York and Boston. This result was not obtained at once; many ingenious devices and contrivances, means and appliances had to be invented and discovered, and conflicting claims of inventors had to be adjusted; but at last all the difficulties have been remedied, and now the public may be assured that within the next two years, unless the automatic system shall be throttled by the Western Union Company, the telegraph rates will be reduced more than fifty per cent. and the business more than quadrupled.

—1875.—

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7

METALLIFEROUS DEPOSITS IN ALTAI, CHINA.

M. BERNHARDT DE COTTA has made a study of the metalliferous deposits of Altaï. These beds are extremely numerous, and may be counted by several thousands, if count is made of those only the existence of which has been proved. They are found chiefly in the western part of Altaï, in the neighbourhoods of Schlangenberg, Ridderak, Nikolajewak, Beloussowosk and Siranowsk; nevertheless, there are some also in the southern part and near Salair. The eastern part of Altai is the least known, and no one has undertaken its exploration.

All the metalliferous deposits at present explored have, as M. de Cotta observes, certain common characteristics. They are most frequently irregular in deposit, but there are veins with large masses. They are generally imbedded in palæozoic lands, belonging to the Silurian, the Devonian, and the carboniferous series; being, for example, in schistose rocks, presenting alternations of grauwacke, quartz, schist of petrosilex or feld-spar, as also calcareous schist, in which Devonian fossils are found. They are met with much more rarely in crystalline schist, and they quite disappear in granite, in which there has not one mine been discovered. Yet, in the neighbourhood of the metalliferous deposits, there may generally be observed granite, porphyry and greenstone, the eruption of which seems to have given birth to them. Some mines have also been opened in solid porphyry; and, moreover, the beds are constantly traversed by veins of greenstone, tanglte, porphyry, or trap.

The metalliferous deposits of Altai are ordinarily formed of sulphate of baryta, quartz, and metallic sulphites; but these last have been much decomposed; and to a great depth, and transformed by oxidation to cored minerals. Crystallised minerals are very rarely met with, and consists of products of decomposition of the secondary formation.

In regard to their yield of metal, they are distinguished as minerals of silver and minerals of copper, between which there is, nevertheless, no well-defined difference. The silver minerals ordinarily contain copper, a little gold, lead, zinc, and a great deal of iron; on the other hand, the copper minerals likewise contain silver and the other metals just mentioned. In the Sadowinski mine tellurium is met with, which is combined with silver and lead; but the metalliferous deposits of Altai present little variety in their minerals. The silver is in the state of native silver, of chloride, telluride, and sulphide, and is found also in the state of red silver, fahlerz, and argentiferous galena. The copper is in the state of native copper, sulphide of copper, variegated and ordinary copper pyrites, fahlerz, red and black oxide, copper pitch-ore, carbonate (malachite and azurite), and brochantite.

The gangue of the metalliferous deposits in Altai is characterised most particularly by the rarity of spathic carbonides and fluor spar. Besides, the ores never hardly contain cobalt, nickel, bismuth, antimony, arsenic, mercury, tin, or tungsten.

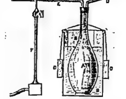
In the metalliferous beds of Altai there is no belted structure following the roofs, and generally the latter are not parallel; they are irregular deposits.

In conclusion, M. B. de Cotta has not a doubt that the metalliferous beds of Altai have been deposited by the waters which are held in solution by the ores necessary for the formation of the different metallic sulphides, as also the quartz and sulphate of baryta. If they are decomposed and changed to ochreous ore unto a great depth, it must be attributed to their not having been covered by the sea and more recent land formations; so that, since the emersion of Altai, which reaches to the carboniferous series, they have remained exposed to the changes of the atmosphere. It is known that great alterations are observed in the metalliferous localities of Cornouailles, the emersion of which dates from an equally distant period, which have gossan in their higher part.

Eng Mech — May 14 1875

A CHEAP AND EFFICIENT BLOWPIPE.

[9175.]—THE object of the following contrivance is to lessen fatigue to the blower in blowpipe operations, and to do so more cheaply than by using foot-bellows, &c. Very little description is necessary. A is a common paraffin lamp shade (the larger the better) standing in any suitable vessel B, three-fourths filled with water. A is kept in one position by two heavy weights C, C. Into A a cork fitted with two tubes, as in figure, is inserted. The cross-tube, D, can be made out of a glass thistle-headed funnel-tube, the thistle-head acting as a trumpet mouth-piece. The other tube, E, is best made of metal. F is the gas. The action is obvious. Air is blown through D, all the excess air forcing the water out of A up into B. When almost all the water is forced out of it the lips may be closed, and several inhalations taken through the nostrils, the pressure exerted by the water in equalising the level in A and B keeping up a strong current through E. In this way the fatigue of blowing is reduced to a minimum.

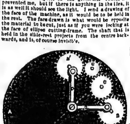


Zigaff.

TISLEY'S COMPOUND PENDULUM APPARATUS.

[7366.]—I HAVE had my attention directed lately, by friends, to the curious and beautiful figures drawn by Tisley's compound pendulum apparatus, and I have, therefore, been induced to give an account of an invention of my own, made a good many years ago, which may, I think, be of interest, and, possibly, of more use than I ever conceived it likely to be. I never carried it to perfection, because my attention was diverted to the geometric chuck. But some years ago I mentioned the subject to several friends, all of whom seemed struck by the idea, and also to a London mechanic, whose name I forget, who had been, I think, a foreman of Evans, Wardour-street, and was recommended to me by Mr. Northcott. He advised me not to have it made, as he did not think it would produce so many or beautiful patterns as the simple geometric chuck, and if it was made strong enough to cut deep, would be more expensive. This I cannot see. The steps by which I reached the invention were these: I wished to produce something like Rose engine turnery, without the expense of a Rose lathe, so I tried first a circular-cutter, revolving at the same time as the lathe, and produced some pretty and curious patterns. I then thought if I could fasten a point at the end of an arm, that should be made to move backwards and forwards in a straight line, I could produce zig-zags. So I fitted up a mandril on the board of the lathe, parallel to the lathe-mandril, with a face-plate, with a slot in it, in which, at any distance from the centre, could be fastened a pin, on which one end of an arm worked, while the other was hinged to a slide, held in the rest, and carried the cutting tool. Then, of course, the lathe-mandril and this mandril being put in motion together, produced zigzags, the number and length of which were determined by the ratio of the two mandrils to one another, and the eccentricity of the pin. It then occurred to me that some curious effects might be produced, if another mandril was fitted up above the lathe-mandril, so that the three mandrils made a right angle with one another. Then if similar face-plates were made to both the extra mandrils, with the eccentric-pins, the arms, from which would, of course, meet in front of the lathe-mandril, or rather cross one another there, and if, where they crossed, they were connected by a pin, on which they could work freely; and if the parallel arm was carried on beyond the place it crossed and carried a tool, that some very curious figures indeed would be produced, and so I found to be the case. I thought then a separate machine might be made to be held in the slide-rest, the eccentrics to be actuated by a train of wheels, one of which should be set in motion by the overhead motion. The train of wheels might produce similar or different velocities. To test it I made one of wood, with the wheels and eccentricities as nearly as possible alike, and a pencil-point to draw the figures. The first figure it drew was exactly the same as Fig. 3 of Tisley's, in *Engineering*, of Feb. 5th.

In examining the matter more closely, I found exactly what he has found in the starting his pendulums, that the nature of the figure was modified by the position the eccentrics held in relation to one another when first started. I found, also, that if the wheels and eccentrics had been exactly similar, it would keep repeating the same line, and that that line would be anything from a straight line to a circle, and what it would be would depend on the position in which the eccentrics were to one another when started. If the eccentrics were in the parts of the wheels farthest from one another or nearest one another when started, it would be a straight line of both eccentrics were on the right hand, or both on the left hand at the same time it would be a circle, and in any position between these an ellipse. One of the wheels bears a shade smaller than the other. Of course the eccentrics kept taking different positions to one another, so that a figure of one line was produced, varying from a straight line to a circle, through all the phases of an ellipse and back at right angles to a straight line, but still being modified according to the position in which it was first started. Of course this figure can be produced, certainly by toothed wheels, one of which has one or more teeth than the other. Indeed all that is necessary is, instead of having two wooden wheels carrying eccentrics and actuated by bands, to have metal wheels with teeth, actuated by a train that joins them, and, no doubt, some very interesting experiments might be made,—so many different ratios and quantities may be established. There are equal quantities and equal eccentricities, but the eccentrics started from different position; then there are equal ratios, but different eccentricities, and these started at different positions, or different ratios and like eccentricities, are all different. I believe that any of Tisley's figures would be produced, and a great many others. If any one likes to experiment with this, some curious results will be produced. Partly want of time, partly having given myself to the geometric chuck, has prevented me, but if there is anything in the idea, it is as well it should see the light. I send a drawing of the face of the machine, as it would be to be held in the rest. The face drawn is what would be opposite the material to be cut, just as if you were looking at the face of ellipse cutting-frame. The shaft that is held in the slide-rest projects from the centre backwards, and is, of course invisible.



A, steel foundation-plate. B B', two wheels, carrying eccentrics. B, with pulley. C C, any connecting-wheels. D D, arms. The centre dot, where they are united, is where the cutting point would be. In its present position at starting, it will cut, if both wheels have equal velocities, a straight line in the direction of the dotted line.

H. S. SAVORY.

GRAMME'S MAGNETO-ELECTRIC MACHINE.

SIR,—I wish to direct attention, through THE ENGINEER, to a project which has of late been brought prominently into notice. It is now about two years since Gramme's patent magneto-electric machine was brought by some speculators, from Paris into this country. The novelty of this machine consisted in giving to the armature the form of a closed ring, wrapped round with a series of small coils of insulated wire, in such a manner that when the ring was caused to rotate before the poles of a permanent or an electro-magnet, a continuous and approximately uniform current of electricity was obtained. This form of armature, I would observe, possesses no practical advantage over the well-known forms contrived by Saxton and Siemens, when arranged to produce the direct current from a well-constructed commutator, but it has the disadvantage of requiring a commutator of complicated construction, and of not producing the alternating current now employed for lighthouse illumination. Had M. Gramme limited the exercise of his ingenuity to improving the magneto-electric machine of which he claims to be the inventor, it might have found a respectable place in the laboratory of the physicist as an instrument of research; but he and those associated with him have, for the purpose of bringing the invention into notice, adopted the principle of electro-dynamic accumulation to produce electric light from an electro-magnet, which, as is well known to those familiar with the history of electrical science, forms no part of Gramme's invention. With the view of giving further publicity to the Gramme machine, the promoters of the speculation obtained permission of the Board of Works to exhibit, at their own expense, an electric light from the clock-tower of the Houses of Parliament at Westminster, and with this semblance of Government patronage, aided by articles in the "Quarterly Journal of Science," and other publications, "The Electric Power Company (Limited)" was formed to purchase and work the Gramme invention. The nominal capital of this company was £100,000, out of which the promoters were to receive £65,000. As a small amount only of capital of this company was subscribed by the public—an amount which would appear to have been insufficient to repay the promoters for their venture—a new company has been recently formed, called "Gramme's Magneto-Electric Company (Limited)," with a nominal capital of £250,000. Out of this capital the vendors of the Gramme invention are to receive the modest sum of £145,000, and, to show their confidence in the undertaking, they have considerately agreed to accept £35,000 of this amount in paid-up shares of the company.

I now come to the more important object of my communication. A short time since, Dr. Antonio Pacinotti, of the University of Pisa, was good enough to send me a reprint of his memoir "Sulle Elettro Calamite Trasversali," from the *Nuovo Cimento* of 1864, vol. xix., p. 378, which contains a description of an electro-magnetic machine with an armature in the form of a closed ring, wrapped round with a series of small coils of insulated wire, in the same manner precisely as in the machine of Gramme. The learned Italian professor states in his memoir that he had one of these machines constructed as early as 1860, for the Cabinet of Technological Physics of the University of Pisa, and that, with either permanent or electro-magnets, it could be used as a magneto-electric machine for producing a continuous current: "Una macchina magneto-elettrica con corrente continua," p. 383. The volumes of the *Nuovo Cimento* are to be found in the libraries of the Royal Institution, London, and other learned societies in Europe and America. The memoir is illustrated with an excellent engraving, from which it will be seen that Signor Pacinotti has anticipated most completely the communication of M. Gramme, entitled "Sur une machine magneto-electrique produisant des courants continus," published in the *Comptes Rendus de l'Academie des Sciences*, tome 73, page 175, 1871, as well as his English patent of 1870, No. 1668. What renders the Gramme scheme the more remarkable at the present time is the fact that, in the month after the appearance of Gramme's note in the *Comptes Rendus*, Signor Pacinotti sent his reclamation of the invention to the French Academy, where it was admitted, as will be seen by reference to p. 544, and to the index of tome 73, where it is described as "Une machine electro-magnetique construite en 1860 d'après le même principe que la machine de M. Gramme." It is scarcely necessary for me to state that, as Signor Pacinotti's memoir of 1864 is to be found in the public libraries of this and other countries, the knowledge therein communicated belongs to the commonwealth of learning, and cannot be made the subject of a valid patent. The publication of these facts, to which I have felt it my duty to draw attention, will, doubtless, prove of public advantage.

Alderley Edge, near Manchester, March 23rd. H. WILDE.

THE QUADRUPLEX TELEGRAPHIC APPARATUS.

A LETTER FROM MR. GEORGE LITTLE ABOUT ITS OWNERSHIP.

To the Editor of The Tribune.

SIR: As the inventor and patentee of the "American Rapid Automatic Telegraph system," now performing such effective service between Chicago, Buffalo, Albany, Boston, New-York, Philadelphia, Washington, and other important cities in this country, will you permit me to correct a slight error—or omission—in your issue of this date, in respect to arguments made before the Commissioner of Patents in Washington, yesterday.

The arguments were made by counsel on behalf of the Western Union Telegraph Company and the Automatic Telegraph Company, relative to the ownership of interest in what is called the "Quadruplex Patents," and all other patents and inventions owned or held in the names of Edison or Harrington, or both. Permit me to inform you that by virtue of agreements dated Jan. 6, 1872, and May 6, 1873, and recorded in Liber Z 18, page 64, Feb. 3, 1875, I own one undivided third part interest, besides the interest in my own patents for my automatic system. I therefore fail to see how Mr. Prescott, the electrician of the Western Union Telegraph Company, can hold the, or any, exclusive right under an agreement made during the Summer of 1874. GEORGE LITTLE,

Cons. Elec. Aut. Tel. Co.

Passaic, N. J., March 11, 1875.

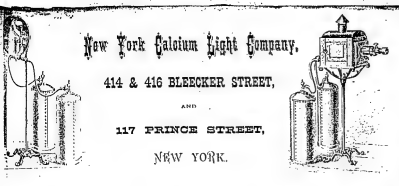
THE COST OF FOREIGN UNDERGROUND TELEGRAPHS.

To the Editor of The Tribune.

SIR: The absolute and the relative cost of aerial and underground lines for telegraphy appears to be the only unknown quantity in the current discussion of the subject. The cost of aerial lines suspended on posts has been given in official American reports as $115 per mile, including one wire, and $33 per mile for each additional wire. For underground lines copper wire is now exclusively used, and in estimating cost it must be considered that the resistance to the passage of the electric current increases with the length of the line, and that, on the other hand, the conducting power increases with the diameter of the wire. Consequently, to insure safety and speed of transmission, heavier wire must be used for great distances than for short lines, so that the cost increases with the length of the line.

The cost of the material being the principal element and alike in both cases, we shall have a positive element for comparison in the experience of the Prussian service, which is for a seven-wire cable, $1,330 (gold) per mile (English) for short distances, and $4,530 for communication between remote cities. Through our cities, of course, the lighter wire may be used, but then the cost of excavation is greater, as is also the case to some degree for the aerial system. With the multiplication of wires, as required in New-York, a great comparative reduction in the compound price can, no doubt, be effected by the acknowledged mechanical skill of the country. This difference in cost certainly should not be any obstacle to the introduction of the reform system for short distances through the principal cities, especially in consideration of the freedom from interruptions and the reduction of the cost of repairs to a minimum. ADOLF CLUSS.

Washington, March 12, 1875.



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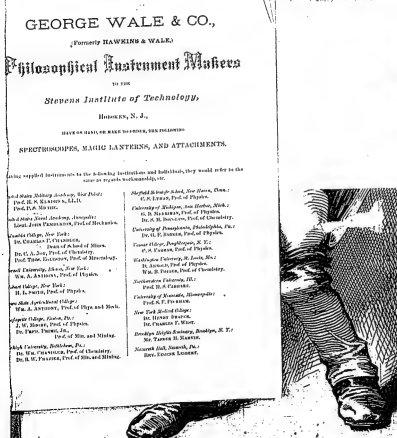


THE WALL STREET ORPHEUS:

Old Orpheus w'th his merry tune,
Made nimble Kine of stock ent alone;
Our Orpheus, more to profit prone,
Plays to the dance of stock alone.

THE WALL STREET ORPHEUS.

Old Orpheus with his merry lays,
Made nimble his fingers and toes;
Our Orpheus, more to profit prone,
Plays to the dance of stock-shoes.

~~~ ~~~MATIC TRANSMISSION.*

No. X.

WE may now proceed to consider some of the principal causes of delay which occur in working the pneumatic tubes, arising from accident or disorganisation. The first of these causes which we select for notice is due to a train stopping in the tube. An event of this nature may arise either from an accident to the train, to the tube, or to the adjacent station apparatus. In such a case the delay is generally very brief, and it is generally sufficient to reverse the pressure on the train by forcing air through it from the next station, care being taken to introduce a piston which drives back the train to the place whence it started.

But when the carrier on the line itself has been damaged, the difficulty is greater; but here again a reversed pressure is generally sufficient to bring back the train intact or partially damaged. When this means fails nothing is left but to find out the position of the obstruction, and this may be easily ascertained with a very close approximation, at the station from which the train has been despatched. This is done by carefully observing the variations of the air pressure in the reservoirs, when they are placed in communication, first with a line of known length, and then with the obstructed tube. The application of Mariotte's law to the results obtained thus indicate within 100 ft. the position of the tube which must be removed. It is very rarely, however, that this operation is necessary. The daily records of the pressure gauges, and the practice which the employés acquire in constantly working the system greatly simplify the work of correcting accidents. It will be easily understood that if the journeys are made with certain pressures, which vary only between certain fixed limits, an empirical graduation of pressures may be obtained. By this means it is possible sometimes to ascertain the exact spot where the obstruction exists. If this method fails, however, the tube may be probed with a rod up to a distance of 150 ft. or 200 ft., and finally when the tubes are laid in a subway, the operation is a much more simple one, because the line is always accessible.

Several apparatus have been designed for recording the exact position of a stoppage in the tube. Fig. 97 shows one of these, the invention of M. Rouart. The piston unrolls a thread *a b c*, which passes from T over the pulley S. The quantity of thread which remains in the tube behind the piston is measured by the counter V, which is connected with the drum S. The thread being guided, and remaining always in tension, it is intended that the length unrolled should always represent exactly the point of the obstruction. Experience of this apparatus has not yet been obtained.

We turn next to a process which is only the adaptation to the special end in view of M. Reynaut's experiments to determine the velocity of sound in tubes. The originality of these experiments rests entirely in the mode of observing and recording the sound wave, on its arrival at the end of the tube. M. Reynaut constructed an artificial ear with a membrane of caoutchouc, but far more sensitive than the human organ. When such a membrane is inflated by the impulse of a sound wave, the movement thus produced may be utilised to close an electric circuit, and by this means records the exact period when the sound reached its destination. The arrangement of this membrane is very simple, and is shown in Figs. 98, 99. A thin band of slightly-vulcanised rubber, A B, is selected, and secured between two metal clips, connected by screws which pass through holes formed in the rubber. A small metal disc is cemented to the centre of the caoutchouc, and above this is a pointed screw D. An electric circuit is closed when C and D come in contact by the inflation of the membrane. This latter carried by a bracket, is placed at the free end of the tube, so that the successive impulses can be registered on a revolving cylinder by means of an electric current. A wave is produced in the pipe by firing a pistol placed near the membrane. This wave traverses the tube at the speed of 330 metres per second, and strikes against the obstruction, from which it is reflected, and traverses the tube in the opposite direction, inflating the membrane. By this means a first indication is marked on the recording cylinder.

The membrane reflects the wave towards the obstacle, which again returns it to the membrane, and thus a second indication is obtained on the cylinder. If then the interval of time between the first and second indication be accurately recorded, it is easy to calculate the distance between the membrane and the obstruction. The chronograph which is employed is furnished with three tracing points; the first of these is placed in the circuit, which is closed by the successive inflations of the membrane, the second tracer corresponds to an electric regulator, marking periods of seconds on the cylinder, and the third subdivides the second intervals by means of an electric vibrator. Fig. 100 is an example of the record thus made. The obstacle is situated in the tube at a distance of 62 metres, and the vibrator marks thirty-three oscillations per second. The interval occupied on the band of paper covering the cylinder, by two consecutive marks of the membrane, corresponds to twelve oscillations.

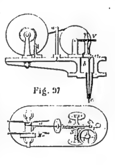


Fig. 97

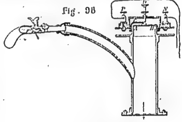


Fig. 98

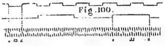
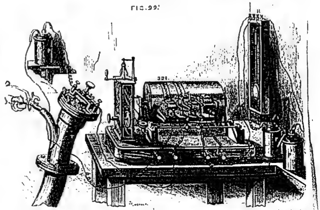


Fig. 100.

FIG. 99.



The distance of the obstacles is then calculated by the following formula: $D = .5 \times 330 \times \frac{12}{33} = 60$ metres, so that the figure recorded by means of the rubber diaphragm approximates to the actual distance within 2 metres.

Mr. Siemens prefers to ascertain the position of an obstacle by filling the tube up to the point of obstruction with water. This ought, with careful measurement of the water, to give the exact position, but the method is somewhat primitive. It will be of interest to notice some causes of accident that have actually occurred.

1. *The accidental Absence of a Piston to the Train.*—In such a case the air acts directly on the carriers, and forces them apart in such a manner, that they arrive at their destination one after the other, either complete or with the cover removed, and with a portion of the despatches left behind. The following train will probably sweep these stray letters through, but an instance has been known in which a despatch remained several days in the tube before it was carried forward to the adjacent station.

2. *Forgetting a Train.*—This appears almost inconceivable; but such a thing has occurred, through carelessness on the part of the operator, in giving the reception signal before the arrival of the train. In one instance to which we may especially refer, the signal for a clear line having been given although a train remained in the tube, a second train was despatched which pushed the first one on to the delivery station, while it remained behind; a third and fourth followed, each being mistaken for its predecessor, and so on throughout the day, the accident having been discovered only in the evening.

3. *Breaking a Piston.*—The packing is fixed to the piston by means of a screwed rod, as already described. On one occasion, during a severe frost, the rod broke, the train stopped, and the whole was directly frozen hard and fast. Considerable difficulty was experienced in freeing the tube. Several pistons were filled with hot water, and directed one after the other at the obstruction, which gradually yielded, and was forced forward to the adjoining station. The screw, however, remained behind, an to recover it, another piston was sent through th tube at a very low speed, a manœuvre which su ceeded perfectly.

4. *Accidents to the Tubes.*—Often the tubes are under the streets in positions where they are no frequently disturbed owing to repairs, &c., of y and gas mains, or even where they are expo shocks in the course of street surface re Under such conditions the tubes may b broken or distorted in form, and in either are of course useless for transmission purpo

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traffic from the above, or from any other causes arises, every effort has to be made, not only to deliver the messages at hand at the time as quickly as possible, but to prevent to the utmost an accumulation of business. The following are the rules laid down in such cases. During the time that the line between any two stations is blocked, a carriage service is organised, at fifteen-minute intervals, to convey the trains over the blocked section with the least possible waste of time. If the delay lasts less than a quarter of an hour, the trifling loss of time is of little consequence. When the delay is prolonged, the polygonal system permits of the substitution of a reciprocating train service instead of the circular one.

To illustrate this subject by an example, we may refer to Fig. 83, see *ante* page 199, where we will assume that the stoppage occurs on line 8-11. It is possible to secure all the requirements of the stations 8, 11, 12, 13, 14, from the centre O, and between themselves by means of the following systems of trains:—

1. 8-O, O-14, 14-13, 13-12, 12-11.
2. 11-12, 12-13, 13-14, 14-O, O-8,

leaving at the same time the stations 8 and 11, and arriving at 13. But in this case the apparatus for the production of compressed air at each of the stations other than 8 and 11, will have to furnish a quantity twice as much as that required in regular working. This extra supply can be obtained for one journey in ten minutes, so that by sending the trains from the 8 and 11 stations at 20-minute intervals, a regular service may be secured throughout the principal *réseau*. In the secondary system the ordinary circular service will continue at 20-minute intervals instead of 15, and a regular delivery will be assured.

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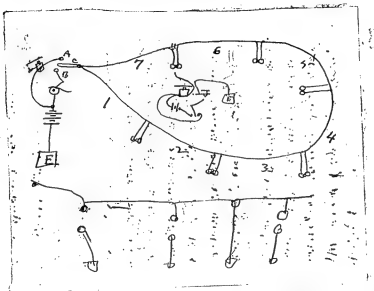
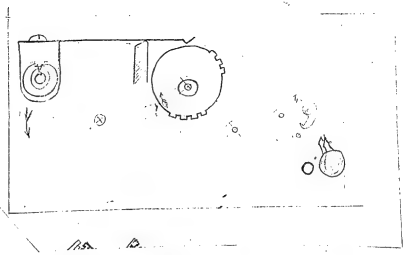
* See *ante* page 199.



Original idea of Edisons for test stations & instruments for the Domestic Tel Co New York & from which I designed the nuts

Batchelor

Goen to me June 27th 1875



No. 15

First sketch of Repeater for Domestic Tel Co's system of Fire alarm from Edisons ideas & from which the working drawing drawing was made

Batchelor

Mr. Crookes began by stating that, in the paper which he had previously read to the society, he had made known how a lever arm of pith, delicately suspended in a vacuum, was found to be repelled by the impact of light or heat-rays. A great deal of success in the experiments was to work with the highest possible exhaustion; results from which air-rates were expected to plane in the lower range of the barometer, and, in the case of the Sprengel pump, which gives a far more perfect vacuum than can be obtained by the use of any other apparatus.

Until lately, the conclusion was drawn, and supposed that light had no action upon a lever arm of pith suspended in vacuo. Indeed, the circumstance that pith could not turn, or even be suspended has been quoted in scientific text-books, as a fact which, if it could be proved, would be the long chain of evidence against the truth of Newton's emission theory of light. Mr. Crookes established a law of pith suspended in vacuo, in a large glass bulb very well exhausted. When a ray of light falls on the pith, it is found that the pith has begun to swing to and fro, the swing gradually increasing in amplitude until the dead centre was passed over, when the opposite revolutions were made. The motion of the suspended pith was found to be in the opposite direction to that with the ray began to turn, in the opposite direction, and on an extensively. These movements were kept up for hours, and the motion was found to be continuous! In fact, when instead of a needle a piece of iron was placed near the bulb, one end of the ray were seen towards it as if attracted; but the truth was, as explained by Mr. Crookes, that radiant heat impinging on the glass bulb, heated the air in the room, and that the presumption of the power (to lessend the radiation on one side) consequently the movement was really caused by repulsion acting in the opposite direction."

Mr. Crookes, in some of these effects Mr. Crookes use a piece of tubular glass apparatus in the shape of an inverted T, Fig. 1, containing a horizontal glass lever, suspended by a very fine glass thread. At the extremities of the lever were attached two pieces of pith, one of which was placed in the centre of the lever was a small mirror, from which a ray of light was reflected on to a graduated scale, by which the amount of motion could be approximated. The pith in each of repulsion produced could be measured. The advantage which a glass thread possesses over a cotton fibre is that the pith always goes back to zero. The fibre used to suspend the lever was so fine that it was only at the end of one of fibre is held to the head the fine usually curls upwards like a corkscrew, and the other end of it thus almost vertically in air.

At the vacuum becomes less perfect the repulsion ceases to be perceptible, and the pith remains where there is no action at all. If still carried to then exhausted, situation instead of repulsion sets in. The barometric pressure of the normal point varies with the density of the suspended substance. Mr. Crookes found that the repulsion of the pith ceases at its mass to be surface, and with normal pressure of the air, the pith is found to be attracted by the unusual action of feeble air currents or of the electric force developed by friction, discovered by Mr. Crookes to be absolutely discovered. Professor Osborne Reynolds suggested that the movement might be due to evaporation and condensation at the surface of the suspended body. Mr. Crookes found that the pith had a little gum on it, and that pieces of difficulty finally grew glass, specially and

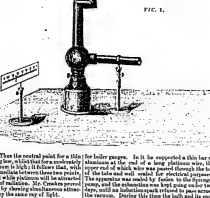
FIG. 1.

attracted repulsion—namely, it was repelled by heat and attracted and eventually by cold.

The most remarkable of all the facts made known by Mr. Crookes was an apparent difference between the action of ordinary light and that of heat. Heat produced a lower repulsion than ordinary light, and yet it made the pith and on pith coated with lampblack, exposing either with about the same force; but, strange to say, the luminous rays repelled the pith coated with lampblack more than the white. This is all the more remarkable because light being reflected from a white surface, it might have been supposed that the unreacted material would have repelled the white surface more than the black one. Mr. Crookes explained the phenomenon by the fact that Crookes constructed an instrument which he calls a "radiometer," and which exhibit much attention and interest both at the society, of the Royal Society and the meeting last week. The apparatus is shown in the annexed engraving, and consists of four arms suspended on a steel point resting on a cup, so that the arms are able to revolve horizontally upon their vertical pivot, just like cups, in fact, as the arms of an anemometer revolve. To the extremities of the arms are attached, as stated above by Mr. Crookes is fastened a thin disc of pith white on one side and black on the other, the black surface of all the discs facing the same way; the pith discs are each about the size of a sixpence. The whole apparatus is placed in a glass receiver, which is then exhausted to the highest attainable point and hermetically sealed.

The arrangement resembles a Barometer of low rarity under the action of light. With one of the instruments Mr. Crookes produced some in 152 seconds when a candle flame was placed at a distance of 20in. When the same candle was placed at a distance of 10in., one revolution was made in 15 seconds; and at 5in. distance, 60 revolutions were given in 15 seconds; it will be seen that the mechanical effect varies almost exactly inversely with the square of the distance, so that theory and experiment coincide.

The instrument, which is found to be very powerful in general against the effects of unheated radiation. The lighted sun furnishes it, the rod of the ball of the first theory conflicted with some of the results, and a candle placed in certainly near enough to produce a very powerful effect, and yet not exploding. As the velocity with which they spin varies with the intensity of the light, in these instruments we have a new form of actinometer. At present there is no good and scientifically exact method of measuring the intensity of light, and the new discoveries may possibly result in the production of a more perfect instrument for this purpose. The action of the radiometer is at present inexplicable on any recognized or unrecognized scientific theory.



other conditions. Then the neutral point for a thin surface of pith being low, so that the force relatively to the pith is greater than the force of the pith, so that the pith will be repelled while pitchers will be attracted by the same power of radiation. Mr. Crookes proved this experimentally by causing simultaneous attraction and repulsion to be exhibited by the pith.

When experiments were first made known, some of the observers tried to account for the effects by heat. In it he supported a thin bar of aluminium at the end of a long platinum wire, the other end of which was fixed to a support through the top of the tube and carefully protected from heat. The apparatus was sealed by fusion, and the Sprengel pump, and the aluminium was kept hung under two days, until an induction spark refused to pass across the interval between the wire and the tube. Two tubes were second those placed in a cold and heat. At the end of the two days' exhaustion the aluminium bar was found to behave in the same manner as, but in a stronger degree, than it would in free perfectly

THE LIMELIGHT SIMPLIFIED.

(NO. 1.)—The introduction of the simple form of Limelight into the magic lantern, or "Blow Through." has been the main cause of its popularity, and it is now used with a supply of common gas, drawn by a flexible tube from the gas-fitting in place. There are many advantages in this method, and it is now generally adopted by all who wish to know, under the rules of the Registration Act, where the lime-cone is replaced by a metal cone, the bit of cotton being either thrown out, instead of the gas. There have been many attempts made to simplify the use of the limelight, but hitherto it has required a very great deal of the most disagreeable of forms of the limelight, as it the case that required the use of a bag of oxygen, and a bag of hydrogen, and a blow pipe in the place where operations were out of the way of getting lad-operator, there, at first start, the new difficulties had to be met.

The apparatus shown gets over these difficulties in

the simplest possible manner, A is a wood made of some fir, in which is a hole, and in it a flexible tube at the top is attached to a brass tube which will fit into the lime-cone, and the other end is a brass and ornamented bold, such as spelter of wax, tapestry, asphalte—wood or metal, perhaps, because, it is not so easy to break.

Underneath, B is a box, which may be observed with notice of what may be called the "Lime" of which the stage must be lighted a few minutes before the pit is ready; it will soon raise the lime to a white heat, and the operator will be able to continue by a slow motion the cone, and be ready to start by as though it were ordinary gas. The lamp is provided with an arrangement of sliding tubes, so that the flame can be regulated to produce a small or large spot, and it is fed with gas from the lamp cone, not by the jet in the jet. The simplicity of repair is exceedingly easily regulated, and the operation of the lime-light is perfectly automatic. There is, however, one point that requires attention, namely, that the jets being made of brass, it is not moderate the vacuum. To prevent this, at the same time that the lamp underneath the operator is lighted, a small jet of gas is lighted in the lime-light jet; when these rules the temperature of the metal is such a point that the vapour passes freely through the lime-cone, and the operator can be ready to start and to detract, and of course, the operator can adjust the arrangement, and have it ready in a few minutes. A time is not in practicability. I have experimented with two fluids—methylated spirits of wine and benzoline, and I find the former is the best, and I have found it to be the best of the operator as well as to each lantern. The spirit is kept burning in a little lamp, and nothing is produced by carbon deposits from one lantern to the other. A single lantern will burn on 8d. of spirit per hour, including the lamp.

For a single lantern I prefer benzoline, as it is more easily manipulated, and produces a more powerful ray of light than spirit. The light is also better; but for a pair of lantern the second lantern with the spirit lantern will consume less benzoline of the spirit.

It is desirable in lectures into the operator's good body of fluid, as the supply of vapour is more regular than when there are only a few drops on the bottom. The lamp is constructed so as to be as it can be, with the lamp, and the lamp can be put in operation by any form of jet. The whole of the apparatus is easily manipulated, and the operation is perfectly safe with ordinary care, than the white is substantiated.

The apparatus is simple, and is easily manipulated, and can be used by a person who ordinary precaution without danger; one pair of pressure boards, and one pair of the vapour, and the operator, and the result is that of lamps-gas being obsolete, equal to the candles.

A. Pumpert.

This Instrument is now Ready for Use.

To call a Messenger:
Push the handle CLEAR IN ONCE and LET GO.

To summons a Policeman:
REPEAT the above TWICE.

To give an Alarm of Fire:
REPEAT THREE TIMES.

In Signalling, do not disturb the handle while it is RETURNING or COMING OUT. Please report at once any failure on the part of a Messenger, or of this Box.

Respectfully, &c.

12 Vesey Street. THE DOMESTIC TEL. CO.

12

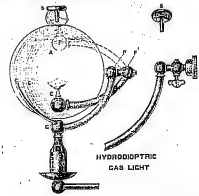
THE HYDRODIOPTRIC GASLIGHT.

[9250.]—When Argand's assistant saw his master discouraged at the smoky non-luminous flame produced by his carefully contrived and constructed hollow cylindrical burner for oil, he, in a moment of idle amusement, took up a piece of glass tube and put it over the dull flame. The invention was by this accidental act perfected, and millions of the Argand lamps have furnished to the reader and student better light than had ever before been available. What the glass chimney did for the Argand burner, a movable arm carrying a gas-burner has lately done in America for the old cobbler's globe. This globe is older than the Argand flame, older than the gas-light. It has served to light the cobbler's task, placed before a farthing rushlight—it has been used by the wood-engraver, and occasionally with imperfect arrangements by the draftsman. But until lately it has not been mounted so as to bring into full play its admirable and useful capacities.

It is now in America placed on a three-armed stand, attached to a gas-branch, so as to be capable of revolution about a vertical axis without changing its place. One of the three arms supporting the globe is a gas-pipe furnished at its upper end with what the trade calls a middle swing, whose horizontal axis would, if prolonged, pass through the centre of the globe, filled with clear water. Another curved arm is attached to the swing, and bears a short scotch tip or gas-burner, using 6ft. of gas per hour. As this arm moves on an axis at right angles to that on which the whole apparatus turns, the two constitute a universal joint, and the light can be adjusted at any angle with the horizon and turned about a vertical axis so as to be directed to any object within range. The rays of light falling upon the transparent globe are condensed by refraction into a beam of nearly parallel rays, which proceed like the beam of light from a light-house, or a lime-light, to a considerable distance, without the rapid diminution to which the light of a radiant point is subject. The whole globe seems to be filled with light, and to be, to the eye, nearly as brilliant as the naked jet itself: being much greater in surface than the jet, it has a much stronger illuminating power. A newspaper can be read at the distance of over twenty feet from the globe when the beam is directed upon it. The adjustment is made by a touch of the finger. From one globe mounted on a chandelier, or bracket, every part of a room can be commanded. The field of light is large enough to cover a desk, a large newspaper page, the paper of the draftsman, the work in the lathe of the mechanic or amateur, the bench of the jeweller, or watchmaker, or engraver. Two or more—in fact, a dozen beams from different globes—can be made to converge upon one point. So that this apparatus furnishes the means of as brilliant an illumination as can be wished for any special purpose. Sculpture, plate, the dresses of women, are brought out in shops, or wherever placed in range of this simple and cheap light. It is believed that it is as great a step in the means of illumination by gas, as Argand's chimney and cylindric burner were in the illumination by oils. Though the globe of glass filled with water, making a spherical lens, is of course subject to considerable spherical and chromatic aberration, these have no ill effects in this application of the lens to illumination.

The spherical aberration simply diffuses the light more equally over the illuminated field, and frees the light from the unsteadiness of a distinct image of the flame. The chromatic abberation does not make itself sensible in the light thrown on the object, which is singularly free from discolouration. The colours of silks, even of yellow silks, seem to be well brought out under it.

The light is fitted up in two forms—one portable, in which the support rests on a socket, the drop-light socket, which will fit on any ordinary burner, already attached to a gas branch. The use of this allows the light to be shifted at will, from one gas branch to another, in the same or in another room. The second form is for permanent attachment to a chandelier or pendent or wall bracket. One may be placed on each arm of a chandelier; each will furnish light upon a table for several persons to read or work by, or it may be attached to brackets over the mantel-shelf, where a pair supply light for all the readers in a family. One against the wall of a chamber is a luxury and convenience which will be appreciated by those who read in bed. Its direct radiant light is effective in the workshop, whose grimy walls and ceilings absorb so much light. This light is thrown directly upon the work to be examined, and one burner commands all the work within twenty or thirty feet distance. The beam from the six foot burner and six-inch globe is, by photometric measurement, by a Bunsen photometer, 150 *times as strong* as the light from a sperm candle, consuming 120 grains of sperm per hour. This is the standard candle used in determining the value of gas, for illuminating purposes. The Parliamentary standard gas-burner is an Argand burner, consuming, with a 7in. chimney, 16ft. of gas per hour. With the HYDRODIOPTRIC LIGHT, the single 6ft. burner gives a light on the object illuminated nearly ten times stronger than the standard gas-burner—making the consumption of 6ft. per hour equivalent for use to that of 50ft. in the 10 standard burners.



HYDRODIOPTRIC GAS LICHT

In the figures herewith (A) is the glass globe 6in. in diameter, (G H) is the socket fitting upon any burner, or the swing joint by which the whole is attached to a gas pipe or branch in permanent form; (G C, G C) are wire arms which with (G F) support the globe in position.

(F F') is a swing joint which carries an arm (F E F' E') on which is the short scotch tip or burner.

(S) is a stopper, a disc of thin metal with a stem to keep it in place. This disc is armed with a little sealing wax, which softens and acts as a lute to make a joint, dust and insect tight, yet to allow any excess of water expanded by heat of the jet to escape.

The water in the upper part of the globe gets warm, not hot; that in the lower portion is not warmed in several hours.

This light is patented in the United States, but not in England or Canada. The inventor expects that it will shortly come into universal use, believing it to be, for reading, writing, study, and work, better than any other light known. Better, too, for the display of goods in shops and stores, and windows. It reminds one of the lime-light, but it is simply a gas branch, and a glass bottle of water, and is cheap and easily managed.

Washington, D.C., 10th May. Gimes.

The Domestic Telegraph Company.

EXECUTIVE OFFICES, 12 VESEY STREET.

Date,

Messenger.	Called.	Returned.	Occupied.	Charge.

Pay no Car fare or Money to Messenger.

Where Sent..............................

Received By..............................

Please Sign Your Name.

13

No CHARGE for a MESSENGER when called to CONVEY a TELEGRAM to the ATLANTIC & PACIFIC or FRANKLIN TELEGRAPH COS.

THE DOMESTIC [Messenger, Police & Fire] TELEGRAPH CO.

12 Vesey Street, N. Y.

The public is indebted to the Atlantic & Pacific & Franklin and to The Domestic Telegraph Cos. for

CHEAP TELEGRAPHY.

OFFICIAL TARIFF.

☞ 1st column gives rate for 10 words or less, and 2d column the rate for each additional word.

ALABAMA.

CALIFORNIA.

COLORADO.

CONNECTICUT.

DELAWARE.

DIST. COLUMBIA.

GEORGIA.

IDAHO.

ILLINOIS.

INDIANA.

IOWA.

LOUISIANA.

MARYLAND.

MASSACHUSETTS.

MICHIGAN.

NEBRASKA.

NEVADA.

NEW HAMPSHIRE.

NEW JERSEY.

NEW YORK.

N. CAROLINA.

OHIO.

PROV. ONTARIO.

PENNSYLVANIA.

PROV. QUEBEC.

RHODE ISLAND.

SOUTH CAROLINA.

TENNESSEE.

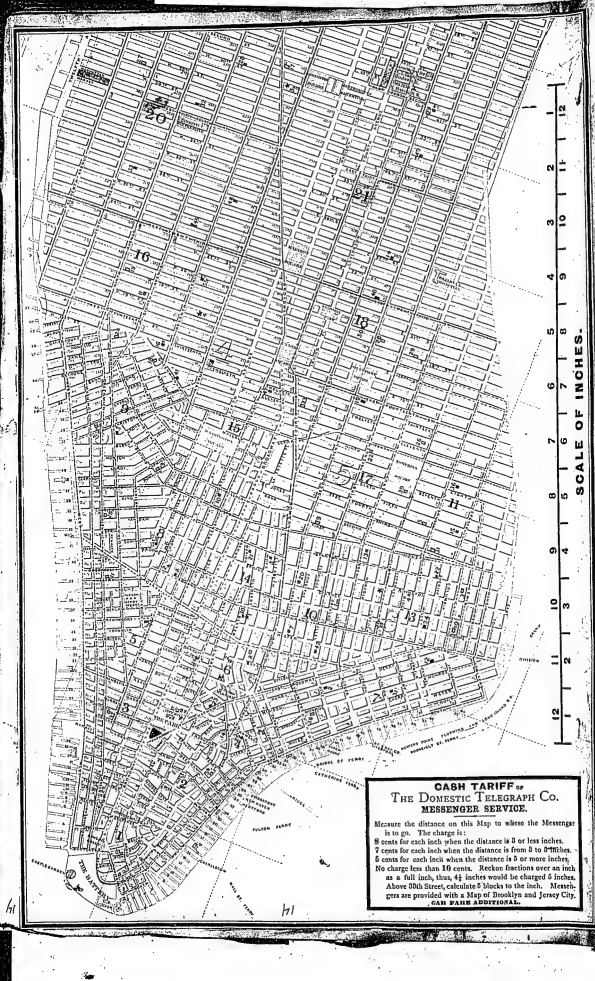
UTAH.

VIRGINIA.

WISCONSIN.

WYOMING.

We PROVIDE the PUBLIC with PROMPT MESSENGERS as WANTED, DISPENSING with BOYS, SELDOM required, although under PAY.



CASH TARIFF OF
THE DOMESTIC TELEGRAPH CO.
MESSENGER SERVICE.

Measure the distance on this Map to where the Messenger is to go. The charge is:
8 cents for each inch when the distance is 3 or less inches.
7 cents for each inch when the distance is from 3 to 5 inches.
5 cents for each inch when the distance is 5 or more inches.
No charge less than 10 cents. Reckon fractions over an inch as a full inch, thus, 4½ inches would be charged 5 inches. Above 80th Street, calculate 5 blocks to the inch. Messengers are provided with a Map of Brooklyn and Jersey City.

CAR FARE ADDITIONAL.

We PROVIDE the PUBLIC with PROMPT MESSENGERS as WANTED, DISPENSING with BOYS, SELDOM required, although under PAY.

15

ELECTRIC WAVES UTILIZED.

THE WONDERFUL INVENTIONS OF MR. THOMAS A. EDISON.

Recording Three Thousand Words by Telegraph in One Minute—Transmitting Four Messages Over a Single Wire at the Same Time—Marvellous Mechanical Ingenuity.

For nearly ten years Mr. Thos. A. Edison of Newark, N. J., has applied himself to the invention of telegraphic systems and instruments. Last year he perfected what is known as the American automatic system, which is in use on the lines of the Atlantic and Pacific Telegraph Company. This system is based upon his discovery that the rapidity with which electric waves can be transmitted over telegraphic circuits is practically infinite and that telegrams can be transmitted at great speed if suitable apparatus can be devised to transmit, record, and overcome certain interfering phenomena which arose to reduce the rapidity.

A number of experiments upon the Atlantic cable had previously been made by the scientists connected with the United States Coast Survey in the determination of longitude, in the course of which it was found that the time which it took for a wave of electricity to travel from Valencia, Ireland, to Heart's Content, Newfoundland, was less than one one-hundredth of a second. This is not strictly the accurate time, as the passage of the electricity through the copper core of the cable acts inductively on the iron sheathing and water outside, and a secondary current of electricity is set up, which reacting upon the primary current passing through the core of the cable neutralizes it for a time, and prevents the appearance of the signal at the distant end. It is admitted by experimental electricians that a message composed by the transmission of long and short waves of electricity through the core of the Atlantic cable, from the battery at Valencia to Heart's Content, for example, returns through the earth to Valencia, and thus forms an electric circuit. If it was possible to discover a means by which the secondary currents set up by the passage of the primary signalling current through the Atlantic cable could be neutralized or accurately compensated for several thousand words a minute could be transmitted, and messages could be sent from New York to London for what they cost from New York to Philadelphia.

On land telegraphs the same phenomenon of secondary currents presents itself, but in an infinitely smaller degree, for in this case the suspended wire must act inductively through many feet of earth, and the strength of these currents increases in proportion to the close proximity of the earth and line.

ELECTRIC WRESTLING.

In 1871 Mr. Edison invented a system of compensation for these secondary currents, which although inapplicable to submarine cables, was successful upon land telegraphs. The principle is thus briefly told in his own words: "I found on trying to transmit waves from Washington to New York that the passage of the current over the wire set up a secondary current, which passed in a direction that mutilated the signals. It then occurred to me that if I could attach any device to the wire which also by the passage of the signalling wave would set up a secondary current passing in the opposite direction to the other secondary current, the two would balance or "wrestle" telegraphically with each other and leave the signals to come clear and sharp. Such a device was soon found. It consists of an iron ring, upon which is coiled a long fine insulated copper wire, a number of them being placed along the line at intervals of several miles, one end being connected to the wire and the other to the earth. A small part of the main current passing through the wire acts inductively on the iron rings, in the way that the current on the wire acts on the earth, but in the opposite direction, and the two neutralize each other.

On the wire between New York and Washington 3,150 words have been transmitted and legibly recorded in one minute. The average word consists of five letters, and each letter of four waves, making it necessary to transmit sixty-three thousand waves in a minute, or a little over one thousand waves a second. The message to be transmitted is on a long strip of thin paper, about half an inch wide, in the centre of which, and running from end to end, are groups of holes. A large hole serves to transmit a long wave, or dash, and a small hole transmits a dot. This strip is prepared with great rapidity by an operator seated before a machine having a key board like that of a piano. After the paper is prepared it is taken to a machine connected with the wire. This machine is a simple metallic flanged wheel, turned by a crank, upon which the paper rolls, and is carried forward as the wheel revolves. This metallic drum is connected with the battery. Resting upon the paper in line with the row of holes is a lever, with a smaller roller at its end. This lever is connected with the telegraph wire. If the paper is passed rapidly through this machine, the intervention of the paper prevents the little roller from coming in contact with the drum underneath (paper being an insulator of electricity), but the moment a hole passes, the small roller comes in contact with the drum, and connects the battery with the line for a period of time proportionate to the size of the hole. With this arrangement almost any speed of transmission is mechanically practicable.

RECORDING 1,000 TIMES IN A SECOND.

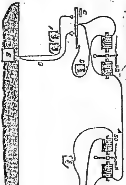
The most curious part is the method of recording the message at the distant station. A metallic drum driven by crank motion, similar to that in the transmitting machine, carries a continuous strip of paper moistened with a solution of Ferri cyanide of potassium. The drum is connected with the earth, and a small piece of iron wire connected with the telegraph line rests on the moistened paper. When a wave of electricity comes over the line it goes down the small iron wire resting on the prepared paper, and then through the paper to the wheel underneath and to the earth; the current resolves the water into its primary elements—oxygen and hydrogen—and the oxygen (which is in a peculiar state called nascent) instantly attacks the iron point, forming oxide of iron. This oxide instantly combines with the Ferri cyanide of potassium and forms Prussian blue—the basis of many writing inks. If the wave is short a small blue dot is formed, if long a long mark or dash is made, and the combination of the dots and dashes forms the letters of the Morse alphabet. The point of an iron wire is thus rusted and cleaned, and a new and colored compound formed 1,000 times in a second by a force 200 miles away.

The system for a long time received little encouragement from the telegraph managers. Gen. T. T. Eckert, formerly superintendent of the Western Union Telegraph Company, was the first prominent telegrapher who saw that it was to be the telegraph of the future.

Mr. Edison has been engaged for several years in endeavoring to increase the speed of Morse transmission by methods radically different in principle from those of the automatic, and has accomplished practically what was for a long time considered impossible. More than twenty years ago Gintl, a German electrician, devised a plan for transmitting two messages over a single wire in opposite directions at the same time, and others since that time have tried the same thing, but no success was attained until Edison in 1865 and Stearns in 1869 brought out their systems. Mr. Stearns's system was purchased by the Western Union Telegraph Company in 1872, and was at once put in use on their lines, proving of immense value by doubling the carrying capacity of all the main circuits.

DUPLEX SYSTEMS.

The principle upon which all duplex systems of telegraphing are based is shown in the diagram below:



The apparatus on the left is supposed to be in Washington, and that on the right in New York. C is called by telegraphers a key, by which the current is thrown in and out of the circuit. The key lever is pivoted at the centre, and is provided with two teeth immediately over two contact wires. The one on the right is in connection with the earth by the wire G; the one on the left to the battery, F, the lever being connected with the line wire. Upon the extreme end of each key lever is a flat spring, which can be made to touch another contact point connected with a battery, D. When neither operator is transmitting, both key levers rest on the points connected with the earth, thus completing the circuit, but without any battery being included in it. The flat springs are also disconnected from their contact points, cutting off the local battery from the balancing magnets at each station. The spiral adjusting springs, when the battery is thus disconnected, draw the lever carrying the iron bar away from the limiting screw on the right of the magnets between which it is placed. Both stations are now ready to receive a message. We will suppose that the operator in Washington depresses his key, C. The lever to which the line is connected is separated from the point connected to the earth wire, G, and placed in contact with the battery, F, the current from which passes over the line, and through the magnets on the right in New York, thence to the earth through the key lever and earth wire. The cores of the magnets attract the iron piece connected with the lever, and are sufficient to overcome the power of the spiral springs, and the sound which it gives in striking the limiting screw conveys to the ears of the operator a "Morse" signal.

The current from the battery, F, in Washington, passes through the magnet, B, also, and its lever would be attracted were it not that at the moment when the attraction of the cores commences the current from the local battery, D, acts upon the wires of the opposite magnet and sets up a counter attraction, which exactly balances that from the main battery, on the same principle as placing two equal weights on the pans of a druggist's scale at the same instant—the beam showing no movement. By this second magnet and battery, D, the receiving instrument, B, remains unaffected by the signals sent from C. But the current going to the distant stations does not bring into action the local current and battery, hence the balancing effect does not take place, and the lever is attracted. Now, if the operator in New York transmits, he throws in the circuit another battery, which sends a current in the same direction as that of the battery in Washington. The effect of this battery upon the receiving instrument is neutralized or balanced in the same way as in Washington, but the extra current acts on the magnet, B, in Washington, and gives it a strength double that of the magnet on the opposite side of its lever; hence the lever is attracted by B, and the signal is made.

THE PRINCIPLE ILLUSTRATED.

This principle is illustrated by a system of water pipes and water, which is shown in the second diagram.

We suppose one part of the water telegraph, by which the electric wave is illustrated, to be in Harlem, and the other end in Wall street. A is a reservoir containing a force pump, by which a constant stream of water may be forced into the pipe M P, at the same time throwing a like stream into S P 1. The water thus thrown into the systems of pipes is insufficient to fill them. B represents a similar reservoir and pump, which throws a stream into the secondary pipe S P 2, and another stream through the main M P in the same direction as the flow from A, the two streams thus forced into the main, filling it. W is a water wheel so situated as to be operated upon by the currents in either circuit. To this wheel is attached a lever, moving between two fixed points, and provided with a retractile spring to hold it against one of these points. X is another wheel, similar to W in all respects. By suitable mechanism a stream of water can be made to circulate quickly in the main and the two secondary circuits. If these two intermediate streams are made to flow from A into the main and secondary pipes, it is evident that that part of the water flowing within the main pipe will, by acting upon the leaves of the wheel W tend to rotate it in the direction of the flow, while that part going through the secondary will operate with equal force to rotate it in the opposite direction, thus causing it to remain motionless, there being an equal amount of power applied on each side. But this is not the case with the wheel X, as no water from A can pass into S P 2, no such balance is maintained by X, which is therefore rotated in the direction of the flow in the main, causing the lever to overcome the force of the retractile spring, and rest against the opposite point. If the flow from A now ceases, the lever of X is instantly drawn back to its original position. It follows that the wheel X can be affected by the flow from A, but that W cannot, and that signals could thus be received from the lever of X by the sound of its contact with the points. Water projected into the main pipe from B, which otherwise affects the wheel X, is balanced by an equal amount flowing into S P 2, and this flow from B, passing within the main, so increases the volume in it as to destroy the balance maintained upon the wheel W by the streams projected from A, and causes it to rotate with the stronger current. It is thus seen that the flow from A affects only the wheel X, and that from B the wheel W, by the balancing properties of the secondary pipes; and that the flow in the main circuit is in the same direction, whether projected by A or B, and that it is the increase and decrease of the volume of the current that permits simultaneous signals to be given, apparently in opposite directions. This apparatus is precisely similar to that of the duplex system, in the latter electricity being substituted for the water, and electro-magnets for the water wheels.

A WONDERFUL DISCOVERY.

Mr. Edison's crowning discovery was bringing to light the fact that by a peculiar manipulation of the electric currents four messages can be transmitted over a single wire in various directions at the same time. This apparatus was called by the inventor the Quadruplex. It is used by the Western Union Telegraph Company, and according to Mr. Orton's last report solves the most difficult problem presented to a telegraph manager—how to meet natural increase in business without a corresponding outlay for wires. For this invention the inventor was offered by that company twenty-five thousand dollars cash and a yearly royalty amounting to nearly twenty-two thousand dollars.

In transmitting four messages over a single wire at the same time, four receiving magnets are used—two at each end of the line. Two of these magnets are of the ordinary kind, and respond to currents of a certain strength, independent of the direction in which they flow. The other two respond only to a change in the direction of the currents independent of the strength. A magnet of each kind is put at New York and Washington, and both are so arranged with extra magnets that the transmission of a weak or strong battery current over the wire from New York to Washington through the magnets in New York has no effect upon them. But the current acts upon the ordinary magnets in Washington and a signal is transmitted; if the direction of the current is reversed in New York the other magnet in Washington responds, and another distinct signal is transmitted. While these two distinct signals are being sent to New York from Washington the latter may in the same way transmit two distinct signals from New York. The action of the currents in the line wire itself is complicated, yet no two currents pass each other in opposite directions at the same time, according to the inventor. Electricians differ, however, on this point, some holding that the currents go through the ground, and others saying that an indefinite number of currents can pass upon the same wire.

MR. EDISON'S WORKSHOP.

Mr. Edison is not yet thirty years old; but for the last six or eight years his name has been well known in the telegraphic world. His many inventions of both instruments and systems have done much to simplify, cheapen, and advance telegraphy. His factory in Newark is in a four-story brick building in Ward street. The first story containing the laboratory is a little telegraphic world. Scientific apparatus of every conceivable shape lies scattered about. Cabinets of rare chemicals and chemical apparatus and wires extending in every direction. In one corner is a telegraph instrument connecting the factory with New York and Washington. In another corner is a desk covered with book labelled "Experiments," "Chemicals," "Notices of the Press." The upper stories are filled wi lathes, planers, and screw machines. In second story Stock Exchange indicators made, in the third automatic instruments, and the fourth is devoted to the manufacture of experimental apparatus.

16

District No. ..... } New York, ... 187
..... Street. }

M. .....

To THE DOMESTIC TELEGRAPH CO., Dr.
General Office, 12 Vesey St.

To Messenger or Police service from ..... to .....

To rent of Signal Instrument, from ..... to .....

..... Vouchers Rec'd.

Received Pay for The Domestic Telegraph Company,

By .....

N. B.—If board correct, please call a Messenger and pay this bill no charge being made for each service.

Pollock Bros. 1875 26 Maiden Lane 30

NOTICE

Will be given WHEN this Instrument is READY for use—and until such time please

NOT DISTURB IT.

Respectfully, &c.

12 Vesey Street. THE DOMESTIC TEL. CO.

C. J. OSBORN & Co.,
BROAD STREET,

By Telegraph from
New York March 30 1875
To C. J. Osborn
Wm P
198 Broad
When will you have my watch gold filled with Waltham movement
Yours
H

The Automatic Fire-Alarm Telegraph.

The efficiency of fire as an automatic telegraph operator was officially demonstrated at the fire in the building of the Tribune, on the 5th of March, 10 Ninth street. At 7 o'clock, or so, an automatic despatch was received at the Murray street fire department patrol station, giving notice of a fire in the sub-cellar of the Worth street building. The patrol responded, immediately, and reached the building within three minutes after receiving the alarm, but finding that the fire was attacking rapid headway the patrol called the Fire Department by their assistance. A second alarm was received at the patrol station from the basement of the building, at five minutes past 8 o'clock, a. m. Considerable damage was done to the building, and to property in the fire and destroyed. In considering for some hours before it failed, note a factor that revived sufficient heat to set any of the thermostats which were set to a hundred and thirty degrees, and thereby transmit the alarm. It is only necessary to say that this timely service was performed, through the agency of the Automatic Fire-Alarm Telegraph system, which connected union with the increase patrol and indicates not only the existence of a fire but the specific locality in the building where it is burning. It is not necessary to enumerate the many instances of this service that we have had it applied to the case including of the Evening Post. Not only will a fire in this building be confined to the apartment where it originates, by the fire-proof qualities of the building but its whole, and be given almost instantly after the fire, thus made out, and the damage to furniture, floors, door trimmings, &c., will be prevented.

TRANSFERS.

	From	To
J. W. Potter	Tallahassie, Fla.	Lake City, Fla.
J. P. Morrison	Jacksonport	Nebraska, Neb.
Ella M. March	Saginaw City	Detroit, Mich.
M. S. Bacon	Nebraska, Neb.	St. Louis, Mo.
J. T. Buchanan	Enniskillen, N. B.	Westfield, N. B.
B. Wa[illegible]	St. Andrews, N. B.	St. Johns, N. B.
O. A. C[illegible]	Broadway and Dey st.	14 Broad st.
H. Fitchett	Corn Exchange	B'way and Dey st.
T. R. Keodber	Harlem	Mott Haven, N. Y.
A. A. Smith	Broaway and 5th st.	B'way and Dey st.
Wm. Talcott	Cotton Exchange	" "

FIGURES PRINTED BY LIGHTNING.

Persons who are killed by lightning stroke are frequently found marked about the body in a peculiar manner, the lines being grouped into semblance of the trunk and branches of a tree. In case the casualty actually happens anywhere in the vicinity of a tree, the ramifications are attributed to some mysterious property of the lightning, which reproduces on the body (as was stated in a published instance) "the fibres, leaves and branches with photographic accuracy.

Mr. C. Tomlinson in a communication to *Nature*, states that the trees have nothing to do with the figures, which are produced directly by the lightning. The same markings may be found in sheets of crown glass by pressing over them the contents of a Leyden jar. The writer, however, mentions a variety of curious phenomena in which horseshoes, metallic numbers, etc., have been found reproduced on the persons of people struck in their neighborhood. Mr. C. F. Varley throws light on these last mentioned cases in giving the record of an accidental observation made duaing the working of a Holtz electrical machine, the poles of which were furnished with brass balls about an inch in diameter. Noticing some specks on the ball of the positive pole, Mr. Varley tried to wipe them off with a silk handkerchief, but in vain. He then examined the negative pole, and discovered a minute speck corresponding to the spots on the positive pole. This pole sometimes exhibits a glow; and if in this state three or four bits of wax, or even a drop or two of water, be placed on the negative pole, corresponding non-luminous spots appear on the positive pole. Hence it is evident that lines of force exist between the two poles, by means of which we may telegraph through the air from the negative to the positive pole. And in explanation of the above cases, in which the lightning burn on the skin is of the same shape as the object from which the charge proceeded, all that is necessary is that the object be + to the horseshoe, brass number, etc., the discharge being a negative one.

Electrical Properties of Thermal Springs.—The water of thermal springs is sometimes possessed of remarkable electric properties, as appears from recent observations of M.M. Thury and Minich, at Baden, Switzerland. They inserted two platinum electrodes (connected with a galvanometer), one in a thermal spring, the other in the River Limmat, and a continuous deflection of 74° was obtained. Later, when the electrode in the spring got covered with bubbles, the needle went back to 60°; but it returned to 70° again when the bubbles were removed. The thermal water was shown to be negatively elec-

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NOTICE IS HEREBY GIVEN THAT books will be open for subscription to the capital stock of the International Trust Company of New York, at the offices of Messrs. Gray & Davenport, 11 Pine street and 9 Nassau street, New York, on and after the [illegible] day of May, 1873, until and including the 15th day of May, 1873, between the hours of 12 M. and 3 P. M., in pursuance of the provisions of the Charter of said Company, and the act amendatory thereof, passed by the legislature of this state the 28th day of May, 1870. Ten per cent. of the amount subscribed will be payable at the time of subscribing, and the balance on the [illegible] day of May, 1873.

EDWARDS S. SANFORD, Chairman.
OLIVER H. PALMER,
ALLEN MUNROE,
ROBERT H. PRUYN,
GEORGE H. MUMFORD,
J. ALFRED DAVENPORT.
Committee of Incorporation.

ap14 [illegible]

CURRENT TOPICS AT THE CAPITAL.

THE QUADRUPLEX TELEGRAPH CONTROVERSY.

WASHINGTON, April 18, 1873.

The Edison quadruplex telegraph controversy has assumed a new phase. Mr. Edison originally assigned an interest in his invention to George Prescott and a joint application was made for a patent. Mr. Prescott agreed to assign to the Western Union Telegraph Company his interest in the patent, but the Automatic Telegraph Company claimed the whole benefit of the invention through a contract with Mr. Edison. An application was made to the Secretary of the Interior to induce him to overrule the decision of the Commissioner of Patents and to make Mr. Edison the sole patentee. The appeal was made by George Harrington, who also claims to be Mr. Edison's assignee. His counsel, W. E. Chandler and J. H. B. Latrobe, contended on Friday that the Secretary had jurisdiction in this case. Gen. Butler, counsel for Mr. Edison, insisted that the patent should issue to his client alone on the ground that, whatever may have been his arrangement with Mr. Prescott, it was in the nature of a partnership, which had been dissolved by the withdrawal of Mr. Edison without his having received a dollar from Mr. Prescott for any interest in it.—The patent should not be granted to Messrs. Edison and Prescott conjointly, as the Commissioner of Patents recently ordered, but that it should be issued to Edison, leaving any equities which might be claimed to exist by virtue of assignments to be adjudicated by the courts. Senator Conkling replied at once, raising the question of the Secretary of the Interior's jurisdiction over the matter. He contended that the decisions of the Commissioner of Patents are absolutely final as to all purely executive questions. He denied that the Secretary of the Interior had any jurisdiction whatever over any questions relating to patents.

Gen. Butler and Leonard Myers replied by citing decisions of the Supreme Court and the usage of the Patent Office respecting the nature of assignments. Secretary Delano in postponing his decision, said: "I recognise the fact that to the Commissioner is intrusted, in the first instance, the duty of examining and deciding upon all questions that arise before him in his office, and are presented to him; but I am unable to bring my mind to the conclusion that it would be my duty to sign a patent, because in his best judgment he had directed it to be issued, if I, on the evidence in the case as presented to me, should be of the opinion that his conclusions were clearly and distinctly erroneous." In conclusion, Secretary Delano informed the counsel that he would allow fifteen days for the preparation of printed arguments on the merits of the case on the record, after which ten days further time would be allowed for counsel to file replies to briefs.

...d bottom.

...ance care has been decided ...ioners of Patents between the ...of G. B. Prescott and George Harrington, ...n the inventions of Mr. Thomas A. Edi... from whose brain a large number of improvements on duplex telegraph instruments have sprung. It appears that Mr. Edison in 1871, before making his improvements, but contemplating the invention and construction of the same, assigned to G. Harrington two-thirds of all his interest in all the inventions which he agreed to make and construct. Thereupon he did apply for fully one hundred patents, all of considerable merit. But, like most true inventors, he is probably somewhat confused as regards business transactions, for in 1874 he assigned to Mr. Prescott one-half interest in seven of his inventions for which applications were then pending, and in several others already invented but not then in form for application. Mr. Prescott claimed that the Patent Office should issue the patents in such form that his half interest would be recognised, while Mr. Harrington was equally anxious that his two-third interest in said patents should be recognised. The Commissioner decided in favor of Prescott on the ground that in 1871 the inventions in question had probably not been made by Edison, and that Harrington's paper was therefore not an assignment, but merely an agreement to assign; as an assignment, to be valid as such, must point to the thing assigned. Senator Conkling, of New York, appeared as counsel for Prescott in this case.

Judge Emmons, of the United States Circuit Court for the Southern District of Ohio, in a recent decision in the case of Pelton & Taylor against Waters et al., held that accidental discovery is not invention. The defendant Waters had, prior to the plaintiff's invention, produced by accident a lubricator of the kind in controversy in the suit, but did not then understand the principle of the discovery, and was unable to repeat the experiment. Meanwhile the plaintiff ascertained the true mode of constructing the article, so that he could describe to others the *modus operandi*. He was held the prior inventor.

TOO LATE FOR CLASSIFICATION.

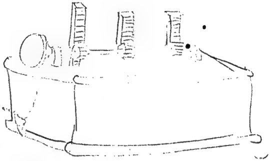
☞ TO THE STOCKHOLDERS OF the ATLANTIC AND PACIFIC TELEGRAPH COMPANY: You are hereby informed that NO "LEGAL TITLE" has yet been acquired to the "Anglo-American Rapid System of Automatic Telegraphy," now in constant use on the principal [illegible] "SAID COMPANY."

The "Anglo-American Rapid System of Automatic Telegraphy" has been endorsed by the "BRITISH SOCIETY OF TELEGRAPH ENGINEERS," in "London," as producing such "STARTLING RESULTS" that its benefits to the commerce of the country will be ENORMOUS.

GEORGE LITTLE, C. E.
Passaic City, New Jersey.

April 5, 1873.

PERSON WANTED FOR A PROF... ...ence. Those thoroughly conversant ...



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1875.

ON WANTED FOR A PROT.

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COTTON GUNPOWDER.

UNDER the above name on Wednesday last another member was added to the steadily increasing family of violently disruptive compounds. This explosive is of the gun-cotton class, although it differs greatly from gun-cotton proper, both in appearance and character, inasmuch as it is a fine powder of pale yellow colour, and, it is stated, can be exploded with a cap direct after having been saturated with 20 per cent. of water. It is in fact a perfected development of what was three years since brought before the public as Punshon's gun-cotton, which consisted of gun-cotton toned down with sugar, and possibly some other ingredient until it could be—and was in our presence—used in a rifle. But the cotton gunpowder of to-day could not be used in a rifle without bursting it, so local and so powerful is its action; neither is it at present intended to be so used, the company who are now manufacturing it confining their production to a material for blasting only, which they make in two strengths, Nos. 2 and 3, No. 2 being the stronger and adapted for hard ground in mining, and No. 3 for slate and other similar workings. This powder is now manufactured on a commercial scale at Oare, near Faversham, where a large number of military and naval officers, scientific and mining gentlemen assembled last Wednesday to inspect the process of manufacture, and to witness some experiments to test its power and safety.

The first point—the manufacture—proved very interesting, as it showed how that from a mere laboratory experiment, the cotton gunpowder had passed through many phases until it had become capable of production in commercial quantities. The initial process as shown to the visitors on Wednesday consists in mixing together nitric and sulphuric acid, in which the cotton is steeped, 1 lb. at a time, after having been hand-picked and further cleaned by being passed through a scutching machine, and afterwards washed and dried. After remaining in the acid for about four minutes, the cotton is withdrawn, and the surplus acid squeezed from it under hydraulic pressure. It is said to bring with it 20 lb. of acid from the tank, 12 lb. of which are pressed out, the remaining 8 lb. being abstracted from it in a centrifugal machine, in which 6 lb. form a charge. From the centrifugal machine the cotton is sent alternately to two steeping tanks and centrifugal machines, and after the second washing and drying it is passed through a pair of coarsely set rolls, and subsequently through a pair set more finely. The fibres have now become finely divided into particles of gun-cotton, and in this condition are subjected to a lengthened washing in a tank of aërated water, the air being forced through the mass of liquid pulp by a fan blast. From the aërating washer the gun-cotton—for such it now is—is run into settling tanks and afterwards partially dried, when it is taken to an incorporating mill, consisting of a pan and pair of edge runners, in which it is triturated in company with one or two other chemical substances, which complete the combination termed cotton gunpowder. It now only has to be dried, and this is effected in wire gauze-bottomed trays placed over a channel through which a current of warm air is driven. From the drying house the powder is taken to the cartridge-filling sheds, and is made into cartridges, which are packed in cases and conveyed to the magazine. The magazine is situated some distance from the works, and is zinc-roofed and surrounded by a broad moat; zinc was preferred for the roof under the belief that if an explosion were to occur, the zinc would volatilise instead of being blown about in fragments.

The second point—the experimental trials—proved no less interesting than the first, inasmuch as it showed how that from a comparatively unsafe and unreliable explosive compound—as the gun-cotton was when we first saw it some three years since—it had become an apparently safe and reliable blasting agent of great power. And this, we should here mention, is due to the pertinacity with which Mr. Mackie, the engineer of the company and manager of the works, and M. Faure, their chemist, have stuck to the task of developing the invention into its present practical shape. Not less credit is due to Mr. Trench, who has had the practical carrying out of the works under the above gentlemen. The first series of experiments were intended to illustrate the safety in transport and storage of the cotton gunpowder, and included the lighting of cartridges by ordinary means, when they simply burned quietly away, and the ignition of others by a capped fuse, when they exploded violently. Some cartridges were then capped with dynamite detonators which previously had failed to explode the cotton powder, which, as a rule, requires a more powerful detonator of special make. Wednesday, however, being a show day, the dynamite detonators, possibly not wishing to be outdone by their special brethren, in each case exploded the new powder, a point, however, which is of no great consequence either one way or the other. In order to show that explosion would not follow upon conflagration, two barrels of the new powder were placed each in a roaring bonfire, and after a time the barrels were burned through and the contents blazed harmlessly away. An iron pile driver weighing half a ton was then allowed to fall 15 ft. on to a box containing 10 lb. of the powder in order to illustrate immunity from danger in such cases as railway collisions, which, so far, it did, as the box was smashed and the powder scattered around.

The second series of experiments illustrated the strength of the powder, and consisted first in placing a charge of 2 oz. in a bore hole made in a block of Kentish rag stone measuring 5 ft. by 3 ft. by 18 in., the explosion of the charge cracking the stone in all directions. Four steel ingots weighing 3 cwt. each were next laid in a pile with 2 lb. of the powder placed centrally between them. The explosion of the charge broke the ingots up and hurled the pieces to long distances. Other four ingots weighing 11 cwt. each were similarly treated with 2½ lb. of the powder with similar results. A cylinder of cast iron 2 ft. in diameter and 18 in. deep was charged in a central bore hole with 6 oz. of cotton gunpowder and fired, but the explosion only blew the hole through, driving a conical shaped piece out of the bottom. A 6 ft. length of 70-lb. steel rail was then laid on its side on bearings 4 ft. 6 in. apart, and in its groove ¼ lb. of the powder was placed and tamped with clay. The explosion broke the rail into four pieces, throwing the two ends far apart. In military work the first illustration given was the cutting off a post of 12 in. by 12 in. timber—assumed to be a stockade post—with 2 lb. of the powder placed against its side. The application of the compound to land mines was shown by placing two boxes each containing 30 lb. of the powder in holes in the foreshore of the Swale—which flows by the company's works—covering them with 6 in. of sods and exploding them. The result in each case was the formation of a crater 22 ft. in diameter and 8 ft. deep, besides the demolition of some of the factory windows, a result, we need hardly say, which was more unexpected than the other. To illustrate the statement that the powder could be exploded even when saturated with 20 per cent. of moisture, a box of the powder stated to be so saturated was placed on the beach and successfully exploded. The concluding experiment was the explosion of 50 lb. of cotton gunpowder suspended in the Swale in a case 10 ft. below water level. The explosion threw up a fine column of water some 200 ft. into the air, much to the satisfaction of the visitors, a satisfaction, however, not inferior to that afforded by the previous experiments, which demonstrated that a safe, handy, and powerful explosive was ready to be placed on the market. It has yet to undergo the test of time and experience in practical use, but from what we saw and heard of it on Wednesday there appears little reason to question its survival in these respects.

The experiments were followed by a luncheon, at which the chair was taken by Major L'Amy, the chairman of the company. The visitors included Lord Kerr, Admiral Elliot, Lieutenant Lamb, Captain Harvey, R.N., Captain McEvoy, Mr. Dunlop, C.B., the representatives of several foreign Governments, the Mayor of Faversham, &c.

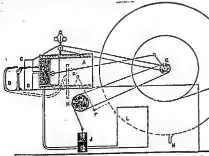
Feb 5 1870 Engineering

Now is the [illegible] made glorious summer by this son of York, and all the clouds that lowered upon our house in the deep bosom of the ocean buried grim visaged war has smoothed his,

NEW PETROLEUM MOTOR.

THERE has recently been constructed at Vienna a petroleum motor for small industries. Its first application to sewing machines is said to have given such good results as to call forth a large number of orders.

The annexed cut (which we copy from the *Revue de l'Industrie*) will give some idea of this motor.



The principle of the machine is similar to that of a horizontal simple-action steam-engine, with this difference—that the force of explosion of petroleum is substituted for the expansive force of steam.

In the bottom of the cylinder A (which has a double envelope) are three valves. The central one, furnished with a very fine sieve, brings into the cylinder the petroleum from a special receiver B. The left one admits at the proper moment, the flame C, which is forced, in intermittent fashion, against the orifice by pressure of air.

The petroleum, introduced in a state of extreme division, can thus be inflamed; an explosion ensues, the effect of which is to close the two valves and drive the piston forward. The piston has a hinge joint, by which oscillates a rod connected directly with a crank. The shaft carries, on one side, a transmitting pulley; on the other, a flywheel. A tappet H acts on a bent lever F, which produces at each revolution of the flywheel, pressure on a caoutchouc bellows E. The air inclosed in the latter is carried by a tube D to the flame of gas or petroleum C, which is elongated for an instant, like that of a blowpipe, and causes the explosion.

The petroleum is introduced into the cylinder simply by atmospheric pressure, and in consequence of the vacuum which the piston makes in advancing. The impulsion of the flywheel brings the piston back again. The air is constantly renewed in the bellows E by a tube K.

To cool the cylinder, a current of cold water is made to circulate between the envelopes; being pumped from the receiver L by the pump J.

Above the cylinder is fitted a governor which regulates the supply of petroleum, by a combination of levers. The smoke produced by combustion of the petroleum escapes by the orifice of the third valve, and goes off by a chimney. The movement of the valve is determined by an eccentric on the shaft.

The whole machine rests on a metal plate fixed on a stand of wood or masonry. All that is necessary to set it going is to open a cock and to light the lamp C.

The petroleum motor is constructed with forces of from 1 to 3 horse-power; for a machine of ½ horse-power the price is 2,500fr., including the foundation-plate and the water-pump. The expense of mounting is small.

The following advantages are alleged:—

1. Absence of all danger through ignorance or malice.
2. Inutility of legal authorisation for fitting up.
3. Instantaneous starting and stoppage.
4. Little noise; very limited occupation of room.
5. Slight expense.

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A New Form of Patent Litigation.—In a recent article, commenting upon the relative number of patent litigations in England, where they grant a patent to every applicant, without official examination, and in this country, where we reject over five thousand applicants for patents yearly, and employ a standing force of five hundred officials to examine or assist the examiners, we showed that in England, out of thirty thousand law cases yearly, only eight were patent litigations. We further intimated that a very large amount of patent litigation, of a character wholly unknown in England, was carried on here, and was a necessary adjunct to our present system. We allude to the litigations before the Patent-office, such as re-examinations, appeals to the Board of Examiners, interferences, appeals to the commissioner in person, appeals from the commissioner to the district court, &c. A new wrinkle in this sort of litigation, and a new direction for appeals, has lately appeared, which seems to indicate that the time has come when Congress should, by the adoption of wise legislation, put an end to this whole business of Patent office quarrelling. Among other duties of the Secretary of the Interior, he is required to sign all patents after they are prepared, passed, and approved by the Commissioner of Patents. On a recent occasion, when the commissioner, after a long and full argument of the matter before him, had decided the case of Prescott v. Edison, in favour of Prescott, ordering a patent to issue in the joint names, the defendant applied to the Secretary of the Interior and petitioned him not to sign or issue the patent. The subject of controversy was a telegraph apparatus. The secretary granted the request, and decided to hear the argument. This was on the 20th of March, 1875, and no decision has been as yet reached. Meantime the contending parties have marshalled their legal forces before the secretary, consisting of six of our most able and expensive lawyers, have argued and re-argued, and have filed scores of pages of printed fol-de-rol upon the subject, for the secretary's consideration. If one dissatisfied applicant may thus occupy the secretary's time, all applicants ought to have the same privilege. If the secretary may nullify one legitimate decision of the Commissioner of Patents, he may nullify all. The money costs of this one litigation before the commissioner and the secretary are stated to have reached, at the present time, over fifty thousand dollars. Jay Gould, it is said, is an interested party on the one side, and the Western Union Telegraph Company on the other. Jay is doing all he can to injure the Western Union Company by running down its stock and inflating the stock of a rival company, of which he owns the control. This case is a little more prominent and has been more expensive than many that are litigated at the Patent-office. But it is notorious that a very large proportion of the time of the Patent-office officials is devoted, in one way or another, to these litigations, which, in the aggregate, involve great expense, but would become obsolete, as they are in England, if we were to adopt the English system of permitting the applicant to make his own examination if he so desires, but confining the duty of the Patent-office to the prompt issue of a patent to every applicant whose papers are presented in proper form. It is alleged by the advocates of the American system that, if our official examinations and Patent-office wrangles were abolished, then the courts would be overwhelmed with patent litigations. But the experience of other nations shows that no such result would ensue. In England, as before stated, they have only eight patent litigations before the courts per annum; while in France, Belgium, and other countries, where no official examination and no Patent-office litigations take place, the number of patent cases brought before the courts is very small.—*Scientific American.*

The Heliograph of Mr. Mance.*

BY C. BECKER.

Through the general introduction of Electric Telegraphy, and the all but universal adoption of the Morse alphabet, it occurred to Mr. Mance—who has the advantage of a thorough knowledge of both, and the privilege, if it can be called one, of a long residence in a country with plenty of sunshine—to develop and improve the existing appliances into a system. His aim has been to produce an instrument which is very compact, very portable, easily set up, and easily worked. Although he was first in favor of larger instruments (which are still preferable for permanent stations), he is now convinced that an instrument of the size here shown is all that is requisite. The chief objection to the adoption of the sun-telegraph is, that we cannot command the sun to shine in the same manner that we can control a galvanic battery; and it must be understood that Mr. Mance advocates his system only as an auxiliary to other systems of field telegraphy. It would come into operation at distances when other methods are useless or tediously slow, and it compares favorably with existing systems of signaling in cheapness, range, rapidity of communication, and, last, in portability. The flashes are invisible to any one placed far to the right or left of the direct line, so that, from elevated points, far distant communications could be kept up with a fortress without the besiegers having any suspicion of the fact.

It would be superfluous to give instances, when within the last few years the use of these instruments might have brought about the most important results.

The instrument consists of a light, but firm, tripod-stand, similar to those used for prismatic compasses. On the top a plate is moved by a tangent screw which admits of quick and slow motion, and the plate carries on a pin a semicircular ring, which again carries on pivots the round mirror, the silvering of which is removed in the center for the space of a circle about 3-16th inch diameter. To the plate is also attached a simple key, which is pressed down and springs back like an ordinary Morse key. This key is connected with the top rim of the mirror by a steel rod, which can be lengthened and shortened—as occasion may require—by turning the handle and screwing the rod through the small brass ball which secures it to the edge of the mirror.

By means of the last-named adjustment and the tangent-screw the glass can be altered, as the ever-changing position of the sun may require.

From 12 to 15 yards in front of the instrument is placed a sighting-rod. This rod is to mark a spot exactly in a line with the center of the heliograph and the distant station. A metal stud marks the spot, and a wooden cross-piece marks where the flash rests when not directed on the opposite station.

The instrument can be set up ready for working in a few minutes. When the exact position of the distant station is not known, a flash of sunlight must be thrown in the direction of the most likely points, and this must be continued till it is answered by a flash, which indicates that a distant signaling party is on the look-out. Then, after releasing the tangent-screw, the glass must be turned to a convenient angle, and the sightingstick must be directed in a line with the distant station by looking through the small aperture in the center of the mirror. When this is effected, the stud must be raised or lowered till it is in the line of vision on a level with the center of the glass and the distant flash, and the short cross-piece must be placed at right angles to the upright, about a foot below the stud. After being thus adjusted the instrument must not be moved.

The spot will be observed gradually to rise or fall, according to the direction in which the sun is apparently moving. The handle of the key, or the tangent screw, or both, as the case may be, must be turned slightly after every two or three words, to insure, as far as possible, that the center of the spot shall be on the stud when the key is pressed down.

When the sun is rather low in the heavens, and behind the signaller, it becomes more difficult to direct the flash with accuracy. In consequence of the obtuseness of the angle the spot loses its circular form, and becomes rather dim when reflected on the stick. If it is required to work frequently with the sun in this position, the employment of a second glass on a light tripod stand is recommended.

But it would be useless here to enter more into the minutiæ of working the instrument: suffice it to say that, in experienced hands, twelve words and more per minute have been obtained, while others state that men—after a fortnight's practice—could attain only from four to five words per minute. As to the distance, 10 and 20 miles—and in very clear weather 40 miles—have been obtained.

A number of officers of the Indian Army have tried and reported upon the instrument, and—with the exception of one—all report most favorably of the system as an auxiliary to existing systems, and efforts are being made at the present moment to insure their adoption for the Indian Service by the authorities.

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*Read before the Society of Telegraph Engineers.

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ad before the Society of Telegraph Engineers.

Sir William Thomson's Tide-Calculating Machine.—At the ordinary meeting of the Royal Society of Edinburgh held on Monday night, Sir William Thomson, President of the Society, showed and described a tide-calculating machine, the object of which was to utilise and apply the method of the harmonic analysis, which had occupied the attention of a Committee of the British Association for several years, to the prediction of tides, according to the results of the most complete analysis that could be applied to observations previously made at any port by the tide gauge. The tide calculator was obtained by a most perfect arrangement of a series of ten pulleys, each of which had an up and down motion, while the centre of each had a circular motion. These gave the mean lunar tide and the mean solar tide, with their respective inequalities. The up and down part of the circular motion alternately pulled up and let go a chain, one end of which was attached to an ink bottle moving in a geometrical slide, and recording the combined results in curves upon a revolving diagram. The two special points in the instrument were the principle of combination which it exhibited, and the geometrical slide for marking. The result gave much more complete information as to future tides at different places than had been hitherto obtained. Formerly the times and heights of high water alone were given, but the tide-calculating machine gave the height of the water at every moment of the 24 hours for the whole year. The tide curves could either be used directly by the harbour-master or sailor, or if it was thought more convenient a table of numbers could be taken with great ease from the curves and printed for general use. In the improved tide gauge, which Sir William also showed, dynamical and geometrical principles had been introduced in such a way as to minimise the errors of the ordinary gauge in use, resulting from friction, and the imperfect rigidity of the different parts. It was also fitted to show the results in a manner more convenient for subsequent use. Under the old system fourteen or more curves were superimposed in an apparently confused manner on one sheet of paper; in the improved tide gauge one curve alone was drawn on a long slip of paper for the whole year or for any other given time. Instead of the scale being as formerly, 12 in. or 24 in. to the 24 hours, he had reduced it to 1 in. for the 24 hours, and thus on a piece of paper of a convenient length the improved gauge could show a simple curve for a whole year. That change rendered it necessary to mark time on the curve itself, and that he did by a horizontal motion of an ink bottle, which made a mark in the curve every hour. Sir William Thomson also described, with experiments, certain capillary phenomena, which had come under his observation while adjusting ships' compasses and otherwise. A vote of thanks was given to Sir William at the close for his interesting communications.

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arches of Professor Kohlrausch and O. Grotrian on the conductivity of solutions of the chlorides of alkalies alkaline earth metals are published in recent numbers of *Poggendorf* (cliv. pp. 1 and 215). It was necessary in their experiments to take great care in noting the temperature and preventing or allowing for any changes in temperature, since the conductivity of electrolytes is influenced by temperature in a very high degree. The source of electricity employed was an induction apparatus, called by the authors a sine-inductor. A magnetised disc is rotated in a coil of wire with such velocity as to produce from 100 to 200 currents in alternate directions in a second. The object of employing a system of currents in alternate directions is to prevent the polarisation of the electrodes. The authors have determined the conductivities of aqueous solutions of nitric acid and of the chlorides of sodium, potassium, ammonium, lithium, magnesium, barium, strontium, and calcium. Three sets of experiments were made as nearly as possible at the temperatures 0 deg., 18 deg., and 40 deg. The conductivity of each substance was investigated at each of these temperatures, the strength of the solutions varying from 5 per cent. of the anhydrous salt up to complete saturation. For a given percentage strength of the solution, it was found that the conductivity increased very rapidly with the temperature, the rate of increase being not quite uniform, but much more nearly so than might have been expected. For instance, the conductivity of potassium chloride (5 per cent. of salt) which is 421 at 0 deg., becomes 931 at 40 deg. This increase is immensely great as compared with that of the electric resistance of a metal or the pressure of a gas. When the temperature remains constant, the conductivities increase continuously with the percentage strength of the solution. The chlorides of calcium and magnesium, however, are exceptions to this rule, the solution of $CaCl_2$ having a maximum conducting power when it contains 24 per cent. of salt, and that of $MgCl_2$ similarly when it contains 198 per cent. Nitric acid of maximum conducting power has a specific gravity 1·1915 (at 17 deg. C).

Engineer May 21 75

MR. A. HOLTZMAN, of Amsterdam, Holland, is the author of a method of laying underground telegraph lines, which is alleged, after two years of trial, to give the most satisfactory results. The Holtzman plan consists substantially in providing a cast iron trough which is filled with a peculiar bituminous insulating compound, which the inventor terms *brut liquide*. The gutter rests in the bottom of a ditch in the earth. The compound is put in while warm and semi-liquid. The telegraph wires, insulated with gutta-percha, are then submerged, separately, in the compound in the trough; the latter is then closed by a cover and the ditch filled with earth. The compound soon cools and solidifies, and holds the wires in perfect insulation, unaffected by moisture, temperature, or decay. A telegraph line of forty miles length near Amsterdam, on the above plan, has, it is said, proved an entire success. Although laid in bad swampy soil, no breaks have occurred. It is alleged that this method of laying wires is economical.

ENGINEER
May 21
1875

GRINDING LENSES.

[7336.]—I beg to inform Mr. Wenham that the correct weight of the crown disc was about 2·5; not less than that; as stated by me in my former letter, the rough surface of the disc, by retaining air bubbles, having led me into the error.

"W. L.'s" letter (7333), giving his plan of grinding concave glasses, is very obvious, very simple, and most likely the reason of his failures (see 1771?). He does not grind cups; his plan produces basins, or rather bells. To render both curves of a double concave directly opposite is not difficult; one good plan being to chuck the half-finished glass in a carefully turned recess of the same diameter as the lens, and cement it there, being careful to see that the rim is well home, and the thing a good fit; but when all this is gone through, how about the marginal errors, which "W. L." ignores altogether, and for which no plan succeeds with me but that given in 7183?

I am, however, an amateur, and have only steel to work with, and fail to reduce finished doubles of larger size, as an accomplished hand like Mr. Wenham, with diamonds, can no doubt easily do.

Having no diamonds, I get an old small three-cornered file of Stubb's manufacture; heat it cherry red, and plunge in mercury; with this, ground to a diamond point, anything in glass or steel can be turned; it must not be brought back.

I have now to afford fellow amateurs such small information as some weeks of constant lens-grinding has given to me.

With Chance's heavy flint, specific gravity, 4·05; refraction 1·64; and dispersion ·033; and his crown 2·50; refraction 1·52; dispersion ·04—I have constructed a reasonably good one-eighth to these curves, viz.:—The front—·1in. diameter of template (crown); the back ·45 (crown). The middle triplet:—Front curve ·175 diameter of template (crown); flint surface ·175, ditto, (flint); back flint ·32, ditto, (flint); crown ·32, ditto, (crown); back crown curve ·33, ditto, (crown).

This glass is defective, as being too near the object, and the secondary spectrum is somewhat more than one accustomed to Powell's lenses considers agreeable. It is nevertheless very fair, and will be very useful.

Will Mr. Oldfield kindly give all the curves of his tenth for comparison, as I fail to consider the above curves consistent with Potter, and feel certain a book on Optics is yet to be written?

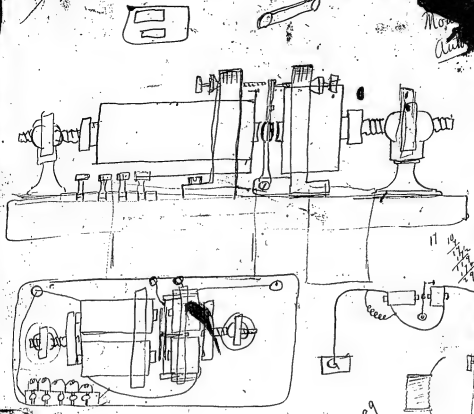
I cannot see any reason why a doublet might not do for the middle, the flint of which would take the meniscus form; nay, a single flint might be effective, and by-and-by I shall try these. But I would fain now attack the other invention of Mr. Wenham's, viz., the double front, but hesitate without some more assistance than his paper in the March (1869) number of the journal gives.

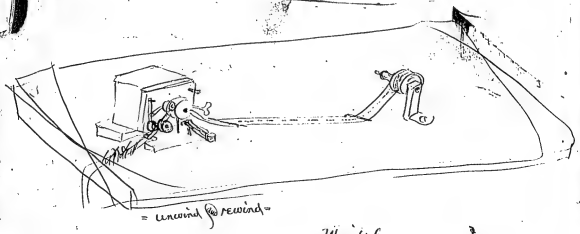
All microscopists and amateur workers owe a deep debt of gratitude to Mr. Wenham, who greatly enhances the value of his communications by the frankness with which he deals with ignorant and blundering workmen like myself.

With Mr. W.'s diagrams before me, and some experience in glass polishing, I had to grind and polish more than thirty surfaces before the above figures were arrived at; in fact they were got by a laborious tentative process, and for the benefit of less persevering friends I beg to inform them that I have arranged before me a row of little failures, some with neat little holes through their centres. I have also to add that although I have a small jigger-lathe, I use a foot lathe of 2½in. centres, with a long mandril in preference, and can work the smallest bit of glass readily on it.

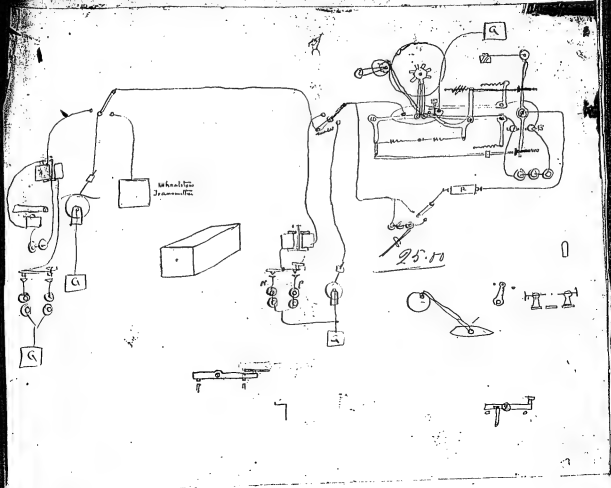
I hesitate to trouble Mr. Wenham with further queries, but I should like to know how to reduce the angular aperture of an objective, if there be any rule for placing the two back glasses the correct distance apart, and if he would give me his opinion of a doublet instead of the triplet in the middle; and finally, if he would suggest some approximate curves for a one-eighth or one-quarter on the double-front idea, to smooth the path towards the attainment ultimately of an objective of 1/50th of an inch.

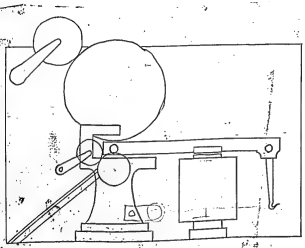
The Ghost.

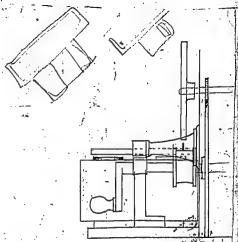


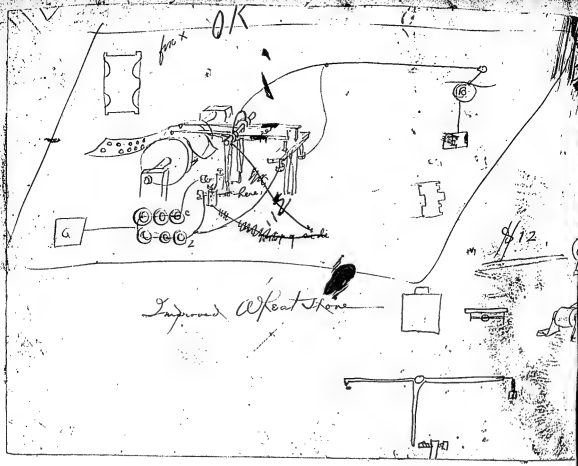


Model


Wheatstone
Transmitter
95.10



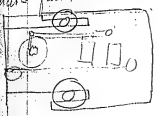


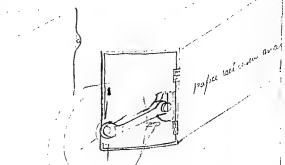

OK
203
Improved Wheat Thresher

DESCRIPTION OF WIRE.		Number of Relays in the Circuit.	Station Tested with	Length of Wire Tested (in Miles).	WEATHER.	THERMOMETER.	Resistance of Conductor (in Ohms).	Resistance of Insulation (in Ohms).	Mileage Resistance of Conductor (in Ohms).	Mileage Resistance of Insulation (in Ohms).	REMARKS AS TO THE WEATHER.—If rainy, state whether the rain extended over all portions of the Circuit; and, if fair, whether it was fair throughout the Circuit.
Number.	Ending at										
1.	Washington.										
2.	Philadelphia.										
3.	"										
4.	Washington.										
5.	"										
7.	Philadelphia.										
8.	"										
10.	"										
11.	Washington.										
16.	"										
17.	"										
18.	"										
22.	"										
26.	"										
27.	"										
28.	Philadelphia.										
29.	"										
30.	Harrisburg.										
31.	Philadelphia.										
33.	"										
34.	"										
38.	Scranton.										
41.	Washington.										
42.	"										
43.	Baltimore.										
44.	Philadelphia.										
45.	"										
46.	"										
47.	"										

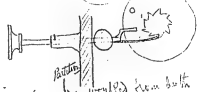
Main frame would be 18 in the way

Sep 24 1875
Particular





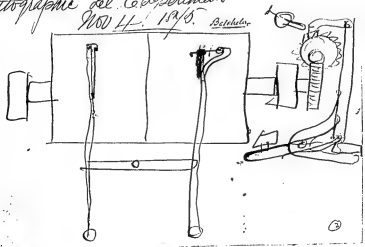
Pins to be put in point X of paper hole to prevent the paper coming from which Bent so taken out squares behind to prevent Indicator from turning round in wrong circle



Pinion can be worked from both ends

①

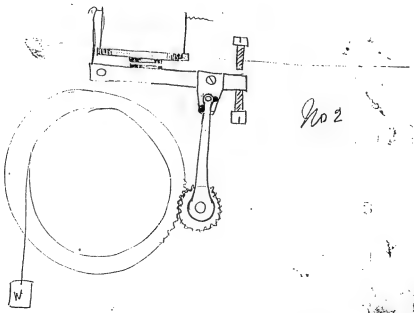
Autoptychic Sel. Experiment
No 4. 1875.



③

25

23

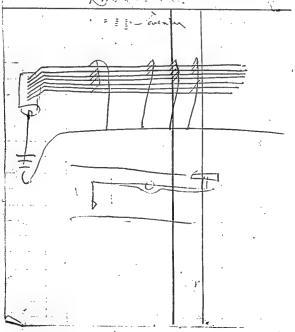


No 2

STATEMENT.

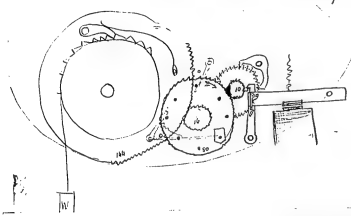
Newark, N. J. _____ 187

To EDISON & MURRAY,
MANUFACTURERS OF
Telegraph Instruments,
10 & 12 Ward Street.



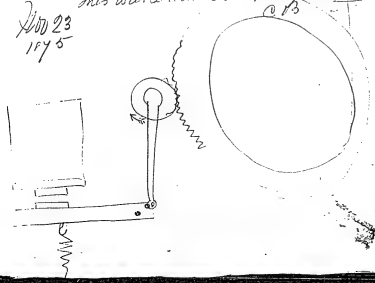
Gone shifter 11, Nov 23 1875

This was drawn about Aug 20th Gong arb



This was drawn about Aug 20th

Nov 23 1875

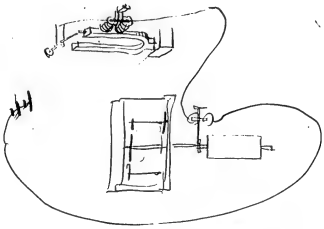


26

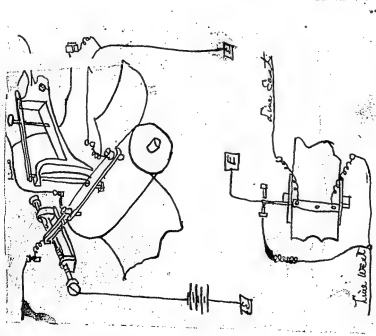
23

Paine's Electric Engine

About a year ago Mr Henry M Paine startled the ~~[illegible]~~ Scientific World by announcing through the Column of a general journal the discovery of a powerful Electromagnetic Engine whose power exceeded that of Steam.



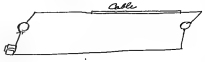
①



②

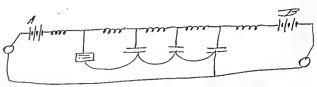
28

Try this. Cable experiment No 1



Try this. 2.

3



10 cells each. Turn a given speed board, then disconnect A & add to B to make 20 cells in B note difference.
4 Condensers

①

Newark, N. J., ... 187

Mr

Bought of EDISON & MURRAY,

MANUFACTURERS OF

Minor Galvanometers, Resistance Coils, Condensers, Submarine Keys.

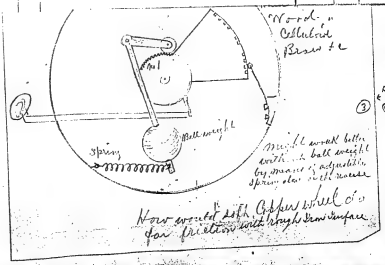
Induction Coils, Differential Galvanometers, Electrometers, Siemen's Ink Recorders.

Marine Galvanometers, Secondary Batteries, Polarized Relays, Morse Registers.

~~Morse Keys.~~ ~~Morse Sounders.~~ ~~Phonomotical App.~~ ~~Lawson Recording Insts.~~

10 & 12 Ward Street, Newark, N. J.

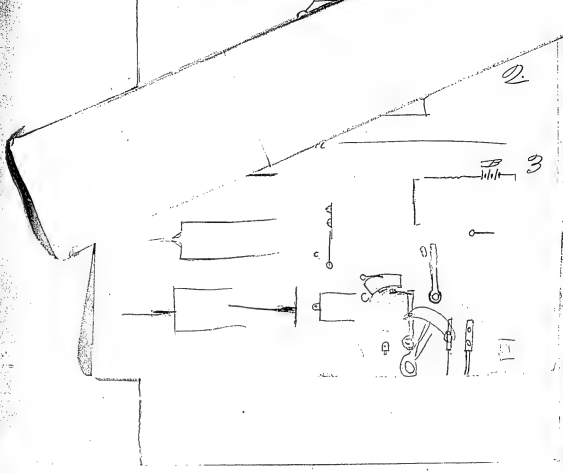
②

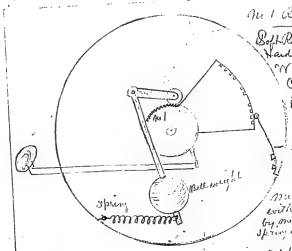


③

see also P. 32. No. 2.

Dry this. Cabb. experim

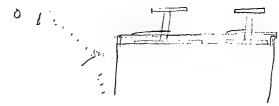


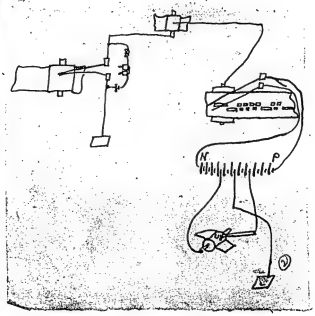


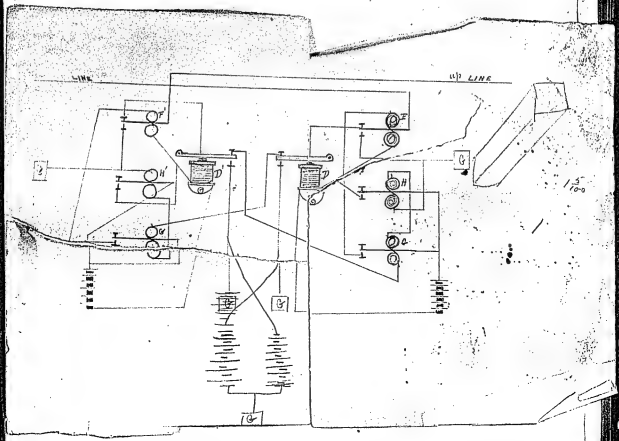
see also p. 32, no. 2.

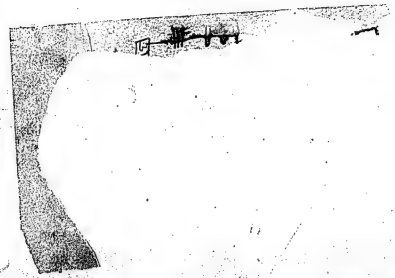
Would weak bottle with a ball weight by means of adjustable spring also will succeed

How would soft rubber wheel do for friction with rough brass surface

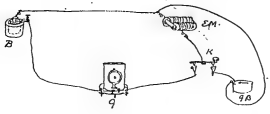





LINE
UP LINE
1/100

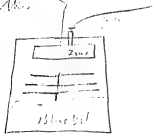


Experiment No 2. Feby 21. 1874.

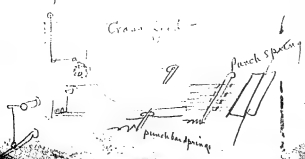


B is a single Daniel cell, G a mirror Galvanometer not K a Key with double contact points EM is the Long Electromagnet, GB a Bradley Galv on No 1 Coil, press Key down & wait for 5 or 10 seconds then open & close as quick as possible, (very quick) If the Mirror Dont move perceptably, and GB Does Then Smash goes Modern theories, the magnet must be quite long and lots of fine wire on it otherwise you will not be able to work the key quick enough to prevent the Mirror working, The armature on EM should be permanently attached, so as to increase the inductive Effect — ①

Try this.



Carried in pocket

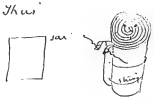


②

(1) ~~B Batty~~ Brook 17 July

14 Feb. 1874

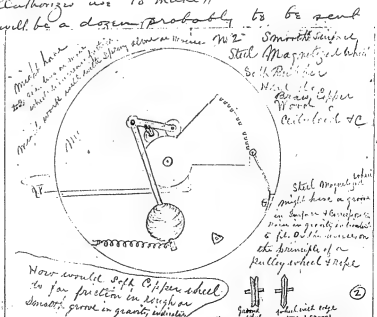
Batch make a secondary battery of one of the large Blue vitriol battery jars and sheet Copper thus



These parallell sheets of Copper are nearly as high as the jar about 1½ inch from edge They are coiled together about ¼ inch apart and may be separated with sticks of wood every 3 inches and then securely bound together with stout marlin so that the two plates cannot possibly touch Even with rough handling. I wish to ascertain the amount of charge & discharge thus will show for a Bridge as well as the length of discharge. of value of a cell. G. C. Reith ①

continued p. 36.

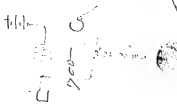
Authorize me to make £5.0 worth which will be a dozen ~~probably~~ to be send



see also p. 25 no. 3

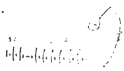
②

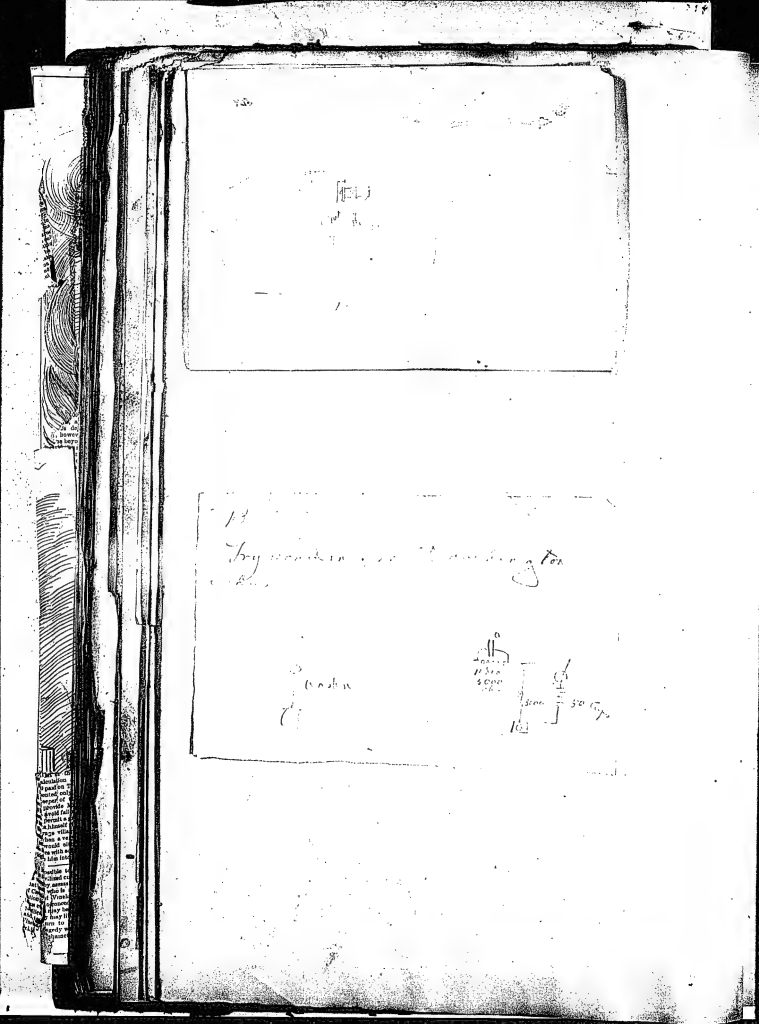
Clear the



Contradictions with claims of
[illegible] 3 a Cattle
it not

a Cow



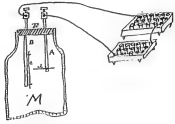


Book 8.

Feb. 22 1874

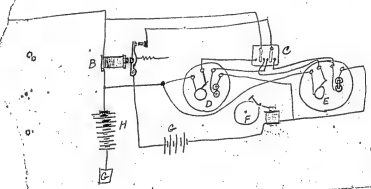
Experiment 201.

To determine whether any electricity pass from one pole of a battery of 100 elements to the other when seperated — a slight distance,



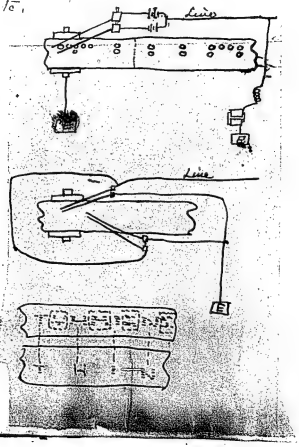
M is a clean dry candy jar F is a tight fitting vulcanite or Hard rubber top. well secured on the jar with plenty of beeswax so that not the slightest trace or air can get within or out. A is are two brass rods B has two metallic projecting pins on which is secured a strip of chemical paper two inches long moistened with a solution of Iodide of potassium. And Starch. [1 grain starch 2 oz distilled water 7 oz Iodide potassium.) A is another rod having a platina wire d facing the Iodized slip c. coming within exactly ½ of an inch from it — These two rods project out of the

Turn over



Page 2 Experiment No 1

Cover and end in Bending posts. These rods should be as far apart as possible, they are Connected with 3 strings of the best battery and placed on a table, the tint of any should be noticed and lenses as well as the time taken the battery is first connected The first tint should be noted and the time taken when it shall have assumed a depth Equal to the first tint on the Chromatic scale shown in Fox's work on Ozone should there be a tint it will prove first, That the particles of air are conductors for Dynamic or Voltaic Electricity of low tension and corollary that induction is the effect of Induction the electric effect being only produced by polarization & unopposing EMF Secondly that Iodide of pot or any other chemical Compound that is decomposable by Electricity in any available light for Ozone - &c.

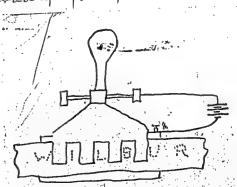


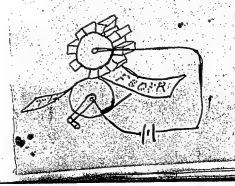
2 Book July 17

along the line, I expect if these batteries are placed on the line 30 miles apart that they will generate (from the action of the brass-melting battery) as much Galvanic Charge and that due to the line that being the Cause the state Charge of the line will be Exactly Compensated for and any length of line may be speed on any Circuit may be ablamed — Book 17 =

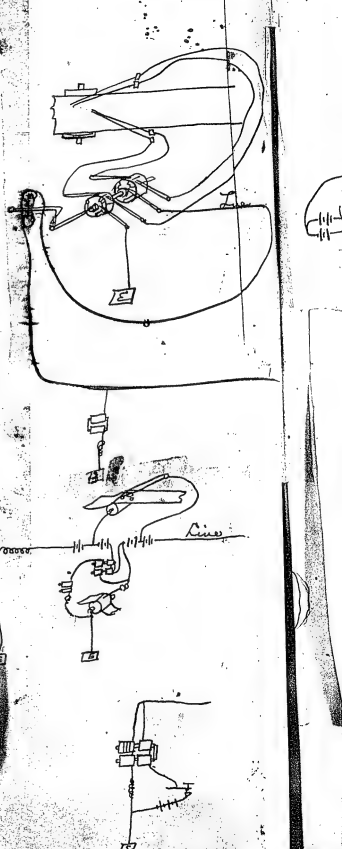
Make a Coil of that yellow jacket wire (small) with perfect insulated joints & Coil it on a magnet (as) two Large Relay Coils so that it will take up the same bulk as if I broke a spread wire would want to insert it in the line of a battery the current of which passes through the yellow jacketed wire also would the outside of a Bichromate battery for with 5 or 6 layers of ordinary Relay wire - wait to see if when I close the circuit of the battery there will be induction on the wire —

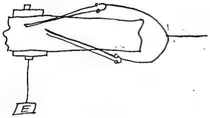
I have an insulated standing battery 60 with the 8 batteries by Connecting the prime Conductor on one end of the plate Glass machine to one end of Battery & other prime Conductor to other Earth & turn for 5 minutes, then with with insulated key throw battery on. Broadly gal glass insulated =





Jones Bros., Cheap Job Print 204 Waverly Place, Newark, N. J.

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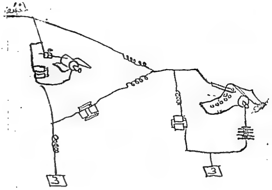
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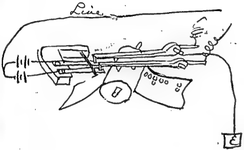
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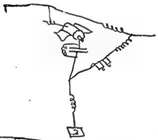
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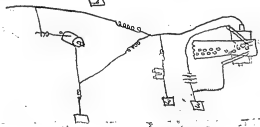
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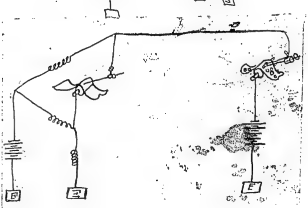
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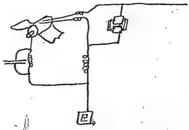
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39

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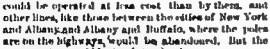
FIG. 1. FIG. 3.



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The first eight metals of the table are extremely rare, and are only sold in minute quantities, but at rates which would make the value of a pound as stated. It will be seen that the expression "worth its weight in gold," is by no means superlative.

VALUE PER POUND AVOIRDUPOIS.

Indium	$2,520 00	Silver	$18 66
Vanadium	2,520 00	Cobalt	7 15
Ruthenium	1,260 00	Cadmium	6 01
Rhodium	540 00	Bismuth	2 43
Palladium	563 50	Sodium	3 20
Uranium	376 58	Nickel	3 00
Osmium	375 20	Mercury	1 25
Iridium	337 66	Antimony	36
Gold	301 46	Tin	31
Platinum	116 20	Copper	30
Thallium	100 27	Arsenic	16
Chromium	56 00	Zinc	11
Magnesium	46 50	Lead	07
Potassium	33 40	Iron	03

(Condensed from the N. Y. Tribune.)

Atlantic and Pacific Telegraph Company.

ANNUAL REPORT OF PRESIDENT ECKERT.

The annual meeting of the Atlantic and Pacific Telegraph Company was held on April 28, at the offices of the Company at No. 194 Broadway. General Thomas T. Eckert was re-elected President.

There were constructed during the year 7284 miles of wire. The lines and connections cover 14,612 miles of poles and 28,477 miles of wire, and brings them into direct communication with 1,285 offices. The number of miles of pole line in the direct control of the Atlantic and Pacific Company at the close of the year was 5,097, and of wire 12,039.

The authorized capital stock of the Company is $10,000,000. The amount issued at the end of the year 1874 was $1,578,100, leaving a balance of 4,219 shares in the treasury.

The gross receipts of the Company for the year 1874, including the Franklin from Nov. 29 to Dec. 31 inclusive, were $450,531 01; the gross expenses were $399,111 97, leaving a net profit of $51,422 04. This surplus and a portion of the Company's funds, derived from sale of its Treasury stock, were expended in the construction and purchase of lines. The Company had on hand at the close of 1874 net assets amounting to $197,113 41, in addition to its Treasury stock. This sum is available for the extension and development of the lines and business. There were also on hand at the close of the year materials and supplies sufficient for about two months use. The Company is free from debt of every kind.

Since the beginning of the year the Company has acquired working possession of the American Automatic System of Transmission, which is protected by thirty-six indisputable patents. The use of this system readily admits of instant change from ordinary Morse to automatic at the will of the operator. The Company has also purchased the exclusive right to the use of the Wheatstone Automatic System of Transmission in the United States and the Island of Cuba. This system has lately been patented in this country by Sir Charles Wheatstone. The Company has also purchased from the inventor, Mr. Thomas A. Edison, and from his business partner and assignee, Mr. George Harrington, the inventions know as the duplex and quadruplex.

They have recently taken charge of the Marine Line, New York to Sandy Hook, for marine news and the services connected therewith.

Arrangements are now being made for extending facilities by an additional route from New York City to St. Louis, Mo., from Chicago to Milwaukee, and from Rye Beach, N. H., to Portland, Me. Other and important extensions and connections to reach all the leading cities, both North and South, are under consideration, with the prospect of favorable results. The reduction of rates by the Company, which took effect on the 15th of February, resulted in an immediate increase of business throughout the territory affected by it, quite equal to expectations. The gross receipts for the first three months of the year were $190,738 42. The increase in March over February was over $7,000, and over January nearly $8,000. Further reductions would have been made before this but for the unusual severity of the weather, which has prevented to a great extent the work upon lines that would otherwise have been done, and the unavoidable delay in the manufacture of automatic machinery sufficient to equip all principal offices.

At Rye Beach, N. H., they connect, by contract, with the "Direct United States Cable Company," whose cable is in perfect working order from Rye Beach to Tor Bay, N. S. The shore end of the ocean cable is laid and buoyed, ready for connection with the deep-sea cable, which lacks less than a hundred miles east from the New Foundland coast to complete communication across the Atlantic.

CUSTOMER.—"Can you deliver this immediately?"

Merchant relieved

THE DOMESTIC TELEGRAPH CO.

EXECUTIVE OFFICES:

No. 52 BROADWAY, NEW YORK.

OFFICERS:

GEN. THOS. T. ECKERT,
President,

J. B. EDSON,
Vice-President.

D. G. FARWELL,
Treasurer and Secretary.

THOS. A. EDISON,
Consulting Electrician.

CHAS. BATCHALOR,
Electrician.

and Customer satisfied.

MERCHANT.—"Yes, if you pay 10 cents for Telegraph boy."

Despatch.

Brought

THE

Subscribe

ONLY

Improved Telegraphic Circuit.

William E. Sawyer, Washington, D. C.—The main principle of this invention consists in a division of the transmitting battery current, and the placing of that battery at the receiving end of a line. The result of this application of electric force is not to free a line of tailings or the attenuation of impulses transmitted, which may exist to any degree in the line wire, but to prevent those tailings or attenuations of impulses from producing any effect upon the instrument. In order to produce or cut off action, or discoloration of chemical paper, in the receiving instrument, it is only necessary that the closing of the circuit at the transmitting end of a line shall set the current from the battery at the receiving end to dividing and a part of it flowing in the direction of the transmitting end. It is not necessary, therefore, that an impulse shall ever reach the transmitting end. It is not necessary that the current shall travel any distance upon the line wire, but that we reduce the potential of current acting upon the receiving instrument; and to reduce this potential, it is merely necessary that the current shall begin to flow by divisions toward the transmitting end.

RISE IN WESTERN UNION STOCK.

Tribune, July 31, 1875.

THE EXPLANATIONS CURRENT IN WALL-ST.—RUMORED PURCHASE OF THE ATLANTIC AND PACIFIC LINE—COMMENTS OF VICE-PRESIDENT GREEN—A REPORT OF THE SALE OF VANDERBILT'S SHARES.

A rumor was circulated at the Stock Exchange yesterday, a short time before its close, that the Western Union Telegraph Company had purchased the stock of the Atlantic and Pacific Telegraph Company. This had the effect of advancing the price of Western Union about 3 per cent, the closing quotations being 83¼. A reporter of THE TRIBUNE visited the office of the Company to learn, if possible, what truth there was in the rumor. President Orton was absent from the city; Vice-President Norvin Green stated that he did not think anything had been done yet in the way of a final agreement, although he did not doubt that there had been some discussion in an informal way upon the subject. "Ours is a business concern the same as any other similar corporation," he remarked, "and I have no hesitation in saying that it is our policy to make the promoters of other lines so sick of opposing us that they will never want to invest any money again in a rival telegraph line. At present we would not pay what Atlantic and Pacific stock is really worth to us just now, as there might be danger of inducing others to try the business. Whenever the managers of the Atlantic and Pacific Company are ready to admit that they cannot operate their lines any longer we stand ready to take their place. This is not necessarily monopoly, as we will do the business as cheaply as it can be done by any one else, but it is business."

At the office of the Atlantic and Pacific Company, Albert B. Chandler, the Secretary and acting manager during the President's absence, said that he did not know anything about the rumored sale of the Company. He thought it was nothing more than a stock jobbing sensation. He could not see the object of selling when the Company had no debts, and had enough money to pay all expenses for extending its lines for a year to come, while its income was as great as its operating expenses. Consequently he placed no confidence in the rumor.

It was also reported on the street yesterday that the rise in Western Union stock was due to the sale of Commodore Vanderbilt's interest in the line to other persons, among whom was Jay Gould and Wm. Orton. No confirmation of this rumor could be obtained during the afternoon and evening.

Jay Gould said last evening, when applied to for information in the matter, that he believed that Mr. Vanderbilt had not sold his Western Union stock, but is still among the largest stockholders. "No arrangement has been made," he added, "between the Western Union and Atlantic and Pacific Companies, although some of the large shareholders of the respective companies have held informal conferences to arrive at some basis for a harmonious working of the two systems that would be mutually advantageous. It is quite probable some such adjustment may be speedily made, especially if it be true that some of the largest holders have interests in both companies. The details of an equitable arrangement require further time to consummate."

THE MEETING OF THE DEMOCRATIC STATE

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admit of the one ...

THE WESTERN UNION SPECULATION.

The *Tribune* semi-officially confirms the statement made in THE DAILY GRAPHIC two days ago that the Western Union Telegraph Company is about to pass under the control of Mr. Jay Gould. The result will be, of course, its consolidation with the Atlantic and Pacific Telegraph Company, and then the whole business and press of the country will be at the mercy of a giant monopoly, which monopoly will be controlled, for his own interests, by a man whose very name is a synonyme of all that is reckless and conscienceless in speculative enterprise. Our readers will bear witness that THE DAILY GRAPHIC, from the start, has insisted that the telegraph, being in its very nature a monopoly, should be under the control of the United States Government—the only power which represents the whole people. We have over and over again declared that it was unwise to allow this great agent of civilization to be subject to the caprices of speculators, and the property interests involved be the foot-ball and sport of Wall street. No man or set of men are good enough or wise enough to have at their mercy the press and business of the country. The telegraph transmits all the news; it tells the story of the markets of the world; it practically fixes the prices of every human product every business day in the year. One day of uncontrolled use of the cable telegrams coming to this country, and flashed over our great network of wires, would enrich a speculator beyond the "dreams of avarice." THE DAILY GRAPHIC has had no help from the press in warning the public against letting the telegraph lines become the property of speculators. Is this is the entertainment to which the leaders of the press invited their associates and the public when they argued for private as opposed to Government monopoly? Has Mr. Jay Gould such mental and moral superiority over all the rest of his countrymen that he should be permitted to wield a power like that which the telegraph will give to any one who controls it! We judge there will now be wholesale conversions, especially among editors, in regard to this very essential matter. Nothing educates so thoroughly as the logic of events.

39

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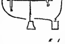


FIG. 3.

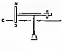
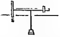


FIG. 2.



A good many of the experiments with the balanced needle, or galvanometer in its common form, are well known, but I have constructed one of another form with which some very curious results are obtained. I described it in almost the first number of the MECHANIC, under the signature of "Jessy Lathe."

A small piece of crinoline steel (a piece of brass would be better), about six inches long, is balanced upon its centre upon the point A (Fig. 1), the small magnet S W, which is 1½in. long, is fixed at the end C of the 6in. piece, so the magnet S W cannot move round its own centre, but must move round the centre A. The magnet can be balanced by

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Palladium	563 60	Sodium	3 38
Uranium	575 50	Nickel	2 50
Osmium	375 20	Mercury	1 25
Iridium	317 44	Antimony	26
Gold	301 45	Tin	23
Platinum	115 20	Copper	25
Thallium	116 77	Arsenic	15
Chromium	50 00	Zinc	11
Magnesium	48 50	Lead	07
Potassium	25 50	Iron	02

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The annual meeting of the Atlantic and Pacific Telegraph Company was held on April 28, at the offices of the Company at No. 198 Broadway. General Thomas T. Eckert was re-elected President.

There were constructed during the year 728 miles of wire. The lines and connections cover 14,612 miles of poles and 28,477 miles of wire, and brings them into direct communication with 1,385 offices. The number of miles of pole line in the direct control of the Atlantic and Pacific Company at the close of the year was 5,097, and of wire 12,083.

The authorized capital stock of the Company is $10,000,000. The amount issued at the end of the year 1874 was $4,578,100, leaving a balance of 4,219 shares in the treasury.

The gross receipts of the Company for the year 1874, including the Franklin from Nov. 29 to Dec. 31 inclusive, were $450,534 01; the gross expenses were $399,111 97, leaving a net profit of $51,422 04. This surplus and a portion of the Company's funds, derived from sale of its Treasury stock, were expended in the construction and purchase of lines. The Company had on hand at the close of 1874 net assets amounting to $137,113 11, in addition to its Treasury stock. This sum is available for the extension and development of the lines and business. There were also on hand at the close of the year materials and supplies sufficient for about two months use. The Company is free from debt of every kind.

Since the beginning of the year the Company has acquired working possession of the American Automatic System of Transmission, which is protected by thirty-six indisputable patents. The use of this system readily admits of instant change from ordinary Morse to automatic at the will of the operator. The Company has also purchased the exclusive right to the use of the Wheatstone Automatic System of Transmission in the United States and the Island of Cuba. This system has lately been patented in this country by Sir Charles Wheatstone. The Company has also purchased from the inventor, Mr. Thomas A. Edison, and from his business partner and assignee, Mr. George Harrington, the inventions know as the duplex and quadruplex.

They have recently taken charge of the Marine Line, New York to Sandy Hook, for marine news and the services connected therewith.

Arrangements are now being made for extending facilities by an additional route from New York City to St. Louis, Mo., from Chicago to Milwaukee, and from Rye Beach, N. H., to Portland, Me. Other and important extensions and connections to reach all the leading cities, both North and South, are under consideration, with the prospect of favorable results. The reduction of rates by the Company, which took effect on the 15th of February, resulted in an immediate increase of business throughout the territory affected by it, quite equal to expectations. The gross receipts for the first three months of the year were $190,736 42. The increase in March over February was over $7,000, and over January nearly $8,000. Further reductions would have been made before this but for the unusual severity of the weather, which has prevented to a great extent the work upon lines that would otherwise have been done, and the unavoidable delay in the manufacture of automatic machinery sufficient to equip all principal offices.

At Rye Beach, N. H., they connect, by contract, with the "Direct United States Cable Company," whose cable is in perfect working order from Rye Beach to Tor Bay, N. S. The shore end of the ocean cable is laid and buoyed, ready for connection with the deep-sea cable, which lacks less than a hundred miles east from the New Foundland coast to complete communication across the Atlantic.

Improved Telegraphic Circuit.

William E. Sawyer, Washington, D. C.—The main principle of this invention consists in a division of the transmitting battery current, and the placing of that battery at the receiving end of a line. The result of this application of electric force is not to free a line of tailings or the attenuation of impulses transmitted, which may exist to any degree in the line wire, but to prevent those tailings or attenuations of impulses from producing any effect upon the instrument. In order to produce or cut off action, or discoloration of chemical paper, in the receiving instrument, it is only necessary that the closing of the circuit at the transmitting end of a line shall set the current from the battery at the receiving end to dividing and a part of it flowing in the direction of the transmitting end. It is not necessary, therefore, that an impulse shall ever reach the transmitting end. It is not necessary that the current shall travel any distance upon the line wire, but that we reduce the potential of current acting upon the receiving instrument; and to reduce this potential, it is merely necessary that the current shall begin to flow by divisions toward the transmitting end.

RISE IN WESTERN UNION STOCK.

Tribune July 31. 1875.

THE EXPLANATIONS CURRENT IN WALL-ST.—RUMORED PURCHASE OF THE ATLANTIC AND PACIFIC LINE—COMMENTS OF VICE-PRESIDENT GREEN—A REPORT OF THE SALE OF VANDERBILT'S SHARES.

A rumor was circulated at the Stock Exchange yesterday, a short time before its close, that the Western Union Telegraph Company had purchased the stock of the Atlantic and Pacific Telegraph Company. This had the effect of advancing the price of Western Union about 3 per cent, the closing quotations being 83¾. A reporter of THE TRIBUNE visited the office of the Company to learn, if possible, what truth there was in the rumor. President Orton was absent from the city; Vice-President Norvin Green stated that he did not think anything had been done yet in the way of a final agreement, although he did not doubt that there had been some discussion in an informal way upon the subject. "Ours is a business concern the same as any other similar corporation," he remarked, "and I have no hesitation in saying that it is our policy to make the promoters of other lines so sick of opposing us that they will never want to invest any money again in a rival telegraph line. At present we would not pay what Atlantic and Pacific stock is really worth to us just now, as there might be danger of inducing others to try the business. Whenever the managers of the Atlantic and Pacific Company are ready to admit that they cannot operate their lines any longer we stand ready to take their place. This is not necessarily monopoly, as we will do the business as cheaply as it can be done by any one else, but it is business."

At the office of the Atlantic and Pacific Company, Albert B. Chandler, the Secretary and acting manager during the President's absence, said that he did not know anything about the rumored sale of the Company. He thought it was nothing more than a stock jobbing sensation. He could not see the object of selling when the Company had no debts, and had enough money to pay all expenses for extending its lines for a year to come, while its income was as great as its operating expenses. Consequently he placed no confidence in the rumor.

It was also reported on the street yesterday that the rise in Western Union stock was due to the sale of Commodore Vanderbilt's interest in the line to other persons, among whom was Jay Gould and Wm. Orton. No confirmation of this rumor could be obtained during the afternoon and evening.

Jay Gould said last evening, when applied to for information in the matter, that he believed that Mr. Vanderbilt had not sold his Western Union stock, but is still among the largest stockholders. "No arrangement has been made," he added, "between the Western Union and Atlantic and Pacific Companies, although some of the large shareholders of the respective companies have held informal conferences to arrive at some basis for a harmonious working of the two systems that would be mutually advantageous. It is quite probable some such adjustment may be speedily made, especially if it be true that some of the largest holders have interests in both companies. The details of an equitable arrangement require further time to consummate."

THE MEETING OF THE DEMOCRATIC STATE

adult of [illegible]

THE WESTERN UNION SPECULATION.

The *Tribune* semi-officially confirms the statement made in THE DAILY GRAPHIC two days ago that the Western Union Telegraph Company is about to pass under the control of Mr. Jay Gould. The result will be, of course, its consolidation with the Atlantic and Pacific Telegraph Company, and then the whole business and press of the country will be at the mercy of a giant monopoly, which monopoly will be controlled, for his own interests, by a man whose very name is a synonyme of all that is reckless and conscienceless in speculative enterprise. Our readers will bear witness that THE DAILY GRAPHIC, from the start, has insisted that the telegraph, being in its very nature a monopoly, should be under the control of the United States Government—the only power which represents the whole people. We have over and over again declared that it was unwise to allow this great agent of civilization to be subject to the caprices of speculators, and the [illegible] the foot-ball and

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The manner of giving signals is ENTIRELY AUTOMATIC.

A SINGLE pressure of the Signal Key gives immediate notice at the nearest Office, to which a messenger will respond in from TWO to FIVE minutes.

TWO pressures of the Signal Key calls a Policeman for the protection of life, person, or property.

THREE signals will summons FIREMEN with Extinguishers, likely to accomplish more at the moment than could the entire Fire Department a few minutes later.

At any moment the services of an Errand Boy are available to go to any part of this or adjacent cities; to make purchases, distribute notices; to mail letters, deliver parcels; to call a physician, nurse, etc. In fact the frequent wants of the DAY or NIGHT are promptly provided for by

OUR MESSENGER SERVICE SYSTEM.

The Domestic Telegraph Company's messengers are NUMBERED and UNIFORMED; polite, efficient and thoroughly drilled in their duties, and can be entrusted to perform any reasonable service.

CHARGES.

TEN CENTS for twenty minutes, which is the smallest charge made; and at the rate of
THIRTY CENTS per hour for any longer time than twenty minutes.
TWO DOLLARS for responding to Fire Alarm Signal, and
THIRTY CENTS per hour while the men are employed.
Special rates on application when boys are wanted by the day or half day.

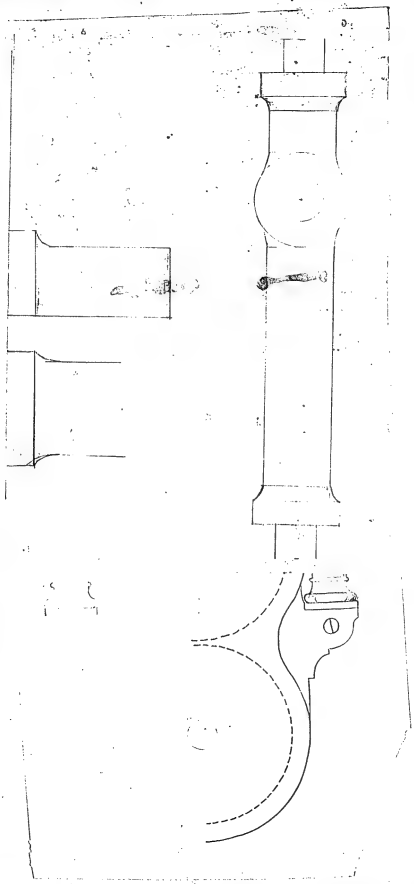
FORM OF SUBSCRIPTION.

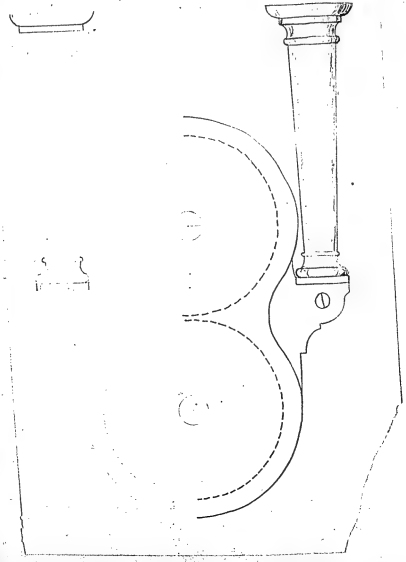
The undersigned for himself requests "The Domestic Telegraph Co" to place in his premises, of their signal instruments, in telegraphic communication with the Company's office, hereby agreeing to pay therefor their regular rate of rental, and the usual charges when the messenger or other service is employed.

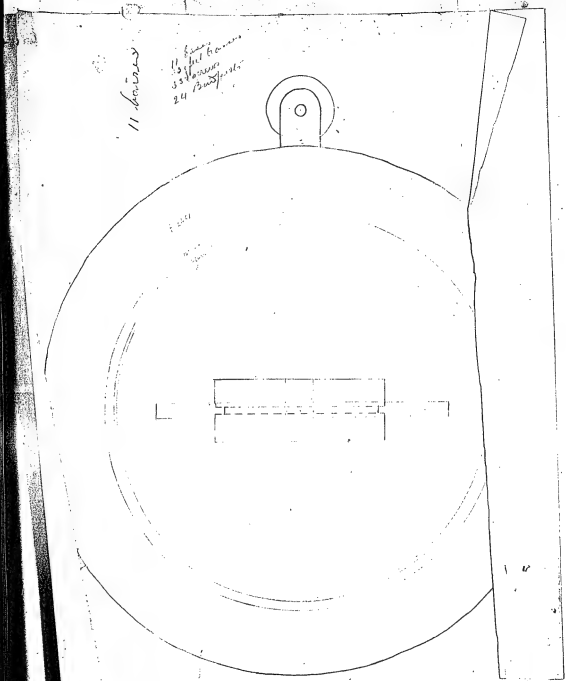
It is hereby mutually understood and agreed that this Company will in no case be liable beyond the sum of One Hundred Dollars for any loss or damage that occurs during, or in course of, the employment of any of its Messengers

Date, ____________ Name,

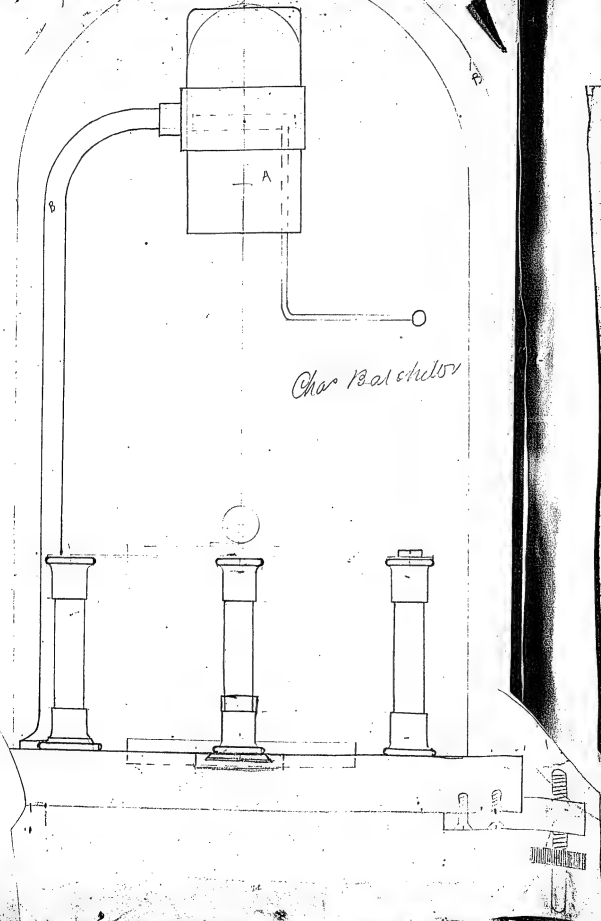
Premises, ____________






11 Sections
Fine
15 Light Harrows
33 Harrows
24 Bushpicks

43



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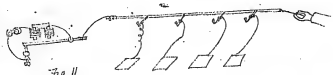


Fig. 11

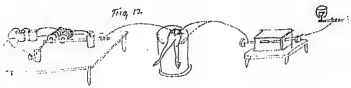


Fig. 12

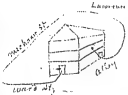


Fig 13

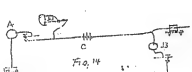


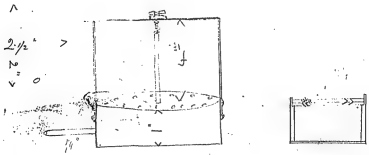
Fig. 14

Fig 15

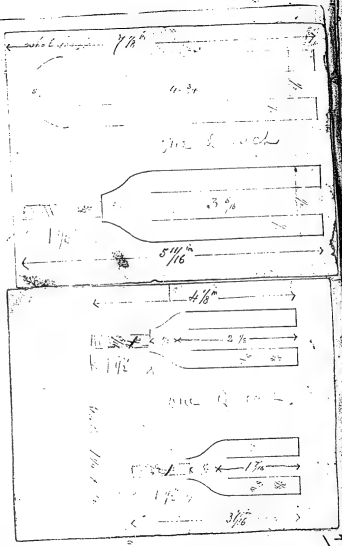
1

20 Holes

This is Rejected



2


7 1/8"
5 11/16"
4 1/8"
3 5/16"

by induction. The very strong spark passing in this instance caused us to think that there must be something more than induction, and we determined to investigate it further. We found that we could draw sparks from the point X, at the end of bar A, by simply touching the point X with a piece of wire in the point X, and we carried it to a close Diff. distance, and, on contact, we got a brilliant spark. Now, on this, we got brilliant sparks. One of the most important properties we noticed was that you could turn the current off and on at pleasure, and from any part of Insif, and get a spark. We now connected

FIG. 1

FIG. 2

a wire from X to the swaybe, and found we could draw sparks from the swaybe in any part of the room, by simply touching it with a file or wire. This we found would do, if we put the wire down up A, and they will feel it around. We now placed a large block of iron about 10c. from the rod, and we found we could do it, although it had no other connection with X than the rod they were both connected to the floor, and the block of iron was about 10 inches long, both each of which, and insulated from each other, and the building, cross bits the laboratory, and we found that the intensity of the force was feebler; but observe that intensity of force, as we proceed to this, it being connected as in Fig. 2.

We now found that it was not necessary to have a vibrator to get the spark, as we could get it from a simple electro-magnet. We took an electro-magnet in three pieces of iron being placed across the poles of the magnet, from which the wire was wound, as shown in Fig. 3, a is the battery, B the electro-magnet, C a shunt, D E, and F the piece of iron. We also found that we could get a most brilliant wire mount between two graphite points; so we made a box containing two graphite points, and placed it in the circuit, as in Fig. 4. After experimenting for some time we found the carbolum (a metal thought to also in nature), of all metals tried, was the best to place on top of the magnet, as the one from which we drew the best sparks. All the other metals tried, placed on the magnet, wire, and box, as complicity to place as to prevent any possibility of electrical induction current, or any other current, from the battery, the magnet, and connecting wire from it to the machine, and also one of the graphite pencils, brilliant sparks were got between the two pencils, although

FIG. 3

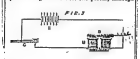


FIG. 4

It was directly grounded by the graphite before it was placed on the box, and the graphite connection was so located by the one manifestation, and by a mirror galvanometer, put in line and connected to the earth, the spot of light could not be induced to deflect a single degree when graphite points would be placed in connection with the earth, as in Fig. 4.

We placed the carbolum bar insides coved of wire, instead of on top of a magnet, and found that we could not induce any current, and we concluded from it, it is not necessary to have a magnet in the circuit, to bring produced directly from electricity. We have made many tests with mirror galvanometer, electroscopes, chemical paper, and Leyden jars marked by accumulation, &c., to endeavour to prove that it is electricity, but without success. These experiments seem to prove conclusively that either electricity does not exist itself in the form of electricity, or that under certain conditions it gives birth to a new and distinct force, generated by distinct force, and that it is not a mere transformation of electricity from our power conductors; That it is a non-polar, radiating in straight lines, like heat, that it is capable of transmission to indefinite distances through unbounded wires, that it is not affected by the magnetic influence, nor by electrical induction, &c., and that it is extensative, the spark large, as I said before, when turned round so as to be Insif. Mr. Edison has named it Pyladic force.

Thomas Edison.

Newark, N.J., U.S.A.

EVERING FORCE.

[MIST.]—Discuss the night of the 29th of November, at Mr. Thos. A. Edison, assistant, by myself, was experimenting in his laboratory, we discovered a force, which, for convenience, we call Evering force. It occurred in the following manner: We had on the table an electro-magnetic vibrator, constructed as in Fig. 1. A is a rod of Russian iron, long; B is an ordinary electro-magnet, of 1000 ohms resistance; C is a shunt; D is the battery, and E is the contact spring. Which working with Edison footed sparks passing between the contact spring and the steel bar A, which did not happen in any way. We found a spark we had taken to the Edison vibrator magnets, it was found that the Edison vibrator, had got in between the electro-magnet, and were specially in electrical contact with the bar A, which, as we had already followed up this discovery some two years ago for a considerable time, when Mr. Edison distinctly came to the conclusion that it was caused

JANUARY 22, 1876]

Scientific American.

(For the Scientific American.)

THE NATURE OF THE NEWLY DISCOVERED FORCE.

BY GEORGE M. HEARN, M. D.

In my letters to the *Tribune* and in my lecture before the Polytechnic Club, I advanced a theory of the force recently discovered by Mr. Edison, that might perhaps apply it to electricity, though in so very known form, and account for its non-polarity and other phenomena exhibited by it. This theory I suggested and used merely as a temporary working hypothesis. At the present time, the weight of evidence in my mind is in favor of the theory that this is a radiant force, somewhere between light and heat on the one hand and magnetism and electricity on the other, with some of the features of all these forces. Experiments of the following kind are of immediate powerful arguments in favor of this theory:

When the wire conducting the force from the battery to the dark box is divided in two parts, and the ends are separated from a sixteenth of an inch, no spark appears in the dark box. Lay these ends of the wire on a semi-conductor, as wood, and the force will pass when they are separated a moderate distance. Place small pieces of tinfoil about the ends of the wire and suspended in the air, and the force passes one inch or perhaps several inches through the air. Place pieces of tinfoil of larger surface about these ends, and separate them a wider distance, and the force will pass. Make the surfaces of tinfoil larger still, until they are a foot square or more, and the force will travel several feet through the air. Prepare three large pieces of tinfoil, place one piece on each end of the divided wire suspended as before, and the other piece about equidistant between them; and still the spark may be seen (though faintly and irregular) in the dark box. The force must jump from the piece of tinfoil at one end of the wire to the middle piece, which acts as a kind of resting place, and thence to the piece at the other end of the wire. The spark has been obtained (though with difficulty, and after very nice adjustment of the parts) perceptible in the dark box! after having passed through four pieces of tinfoil, the distances from the first piece to the last being eight feet. The highest tension statical electricity, is generated by friction (sealing, sealed not do this) and attracting or repelling pieces to pass by points. Through experiments of this kind we have learned one important law of this force, namely, that it prefers to pass through surfaces; and the larger the surface, the better it passes through any half conductor, at least within certain limits.

Experiments of the kind here described suggest magnetism more than electricity or dynamical electricity; but this force does not respond to the test of magnetism, the power to attract iron; and moreover it exhibits phenomena that do not belong to magnetism. It is attracted by iron and other metals, as conductors, but it does not itself attract iron.

The points which favor the radiant theory of this force may be thus recapitulated:

1. It does not respond to any of the physical tests of electricity, except the spark.

2. It produces no perceptible or demonstrable physiological effects, like electricity.

3. It is not retarded by non-conductors as air, water, glass, rubber, and paraffin, in the same degree as electricity.

4. It gives no evidence, in any of its phenomena, of polarity.

5. It passes through non-conductors, as air, rubber, glass, etc., most readily by large surfaces at the terminals, while electricity prefers to pass by points.

6. It diminishes in strength with the distance from the battery, possibly in some definite ratio, although that is not yet demonstrated.

Any form of electricity giving a spark like the spark of this force would respond to some of the physical tests of electricity, would produce readily presumptive physiological effects, would be powerfully resisted by the air, and would in all its phenomena suggest polarity, even if rapidly reversed.

Again, the four facts regarded by me as favoring the theory that this force is allied to electricity, are, when severely analyzed, not so convincing as they might at first appear. The spark of this force resembles the spark of dynamical electricity; it is also does the spark produced by combustion. The velocity of this force is great, but so also is that of light. This force is best conducted by metals; but so also is heat. This force is resisted somewhat by non-conductors, but so also is heat, and both in less degree than electricity.

If it be, as I have suggested, a kind of electricity which, after the manner of the aboilis, returns to its source by rapid forward and backward movements, it would yet be exceedingly easier very different conditions from those under which we are wont to consider it, and would be practically a new force. The more I experiment in this department, and the more closely I reflect on the results of experiments, the farther I seem to be driven from the electrical toward the radiant theory of this force; and there would appear to be no ready means from the conclusion that we have here something radically different from what has before been observed by Science. The relation of this force to the other forces may be thus represented:

Light, Heat . . . New Force . . . Magnetism, Electricity.

The above would represent Mr. Edison's theory of a radiant force, nearer to light and heat than to magnetism or electricity.

The theory I have suggested would bring the force nearer to magnetism and electricity than to light or heat, as follows:

Light, Heat . . . . . New Force . . . Magnetism, Electricity.

The discovery that broad surfaces at the terminals are necessary to conduct this force through non-conducting solid bodies, as glass, rubber, paraffin, etc., was made but a few months ago. That the force passed through air when large surfaces were at the terminals had been proved previously by Mr. Edison's experiments and by my own. A large surface of tinfoil (Sixteen 12x12 inches) was connected with one end of the divided wire, and left on a table. Over this were placed broad pieces of hard rubber, glass, or paraffin, and on the top of these was placed a similar piece of tinfoil connected with the other end of the divided wire, through which the force was to be conducted to the dark box. In this way, it was proved that the force could pass through 1½ inches of lay wood, 2 plates of glass, each ¼ of an inch in thickness, ¼ of an inch of hard rubber, ¼ of an inch of solid paraffin, and 2 layers of paraffin paper. When the surfaces at the ends of the wire were reduced in size, or when the tinfoil at one end was removed, the force passed less easily. When the tinfoil at both ends was removed, and only a few inches of fine wire constituted the surface, the force passed, but through thinner resistance. When only the terminals of the wires were applied to the resisting body, the force would not pass at all, or but a very short distance. The force passed through 8 inches of water, and was apparently indistinguished when when the surface at the terminals was but an inch of fine wire.

Useful Receipts for the Shop, the Household, and the Farm.

A new compound for polishing and cleaning metals is composed of 1 oz. carbonate of ammonia dissolved in 4 oz. water; with this is mixed 16 oz. Paris white. A moistened sponge is dipped in the powder, and rubbed lightly over the surface of the metal, after which the powder is dusted off, leaving a fine brilliant lustre.

A new alloy for ball metal is proposed, which does not tarnish, is less liable to crack, gives a better sound and is more in weight than the alloy usually employed for the purpose. It is prepared as follows: Take 1 lb. and copper 1 lb. are melted and cooled. Add also 2 lbs., aluminum 1 oz. Melt and cool. Melt again, and finally add 1 oz. quicksilver and 8 lbs. melted copper.

A very beautiful application of electro-metallurgy is to apply a coat of silver by electro deposition on natural leaves and flowers. By this means very delicate ornaments are produced, since the peculiar form and texture of the natural leaf are produced under the thin silver film.

Lemons can be preserved by varnishing them with a solution of shellac in alcohol. The skin of shellac formed is easily removed by rubbing the fruit in the hands.

J. Q. B. says: Varnish made with alcohol will get dull and spongy by the evaporation of the alcohol, which leaves water in the varnish, as all commercial alcohol contains water. Take thin shred gelatin, cut it in strips, and put it in the varnish; it will absorb most of the water, and the varnish can be used clear and bright till the last drop. The gelatin will get quite soft; it can then be taken and dried, and used again. "I have used this plan for the last two years in photographic varnish, and have never had to throw away one drop."

There is no simpler remedy for preventing cider growing sour than mustard seed. After the cider has fermented and reached the desired palatable condition, put 1 pint mustard seed to a barrel of cider, and bung tight.

(No. 1 a. Revised Form for Use in Offices.)

No. _____

THE DIRECT UNITED STATES CABLE COMPANY, LIMITED.

NEW YORK: Head Office, Always Open, 16 BROAD STREET.

(The public in New York is recommended to hand in Messages at this Office, whence they will be transmitted direct to their destinations by independent wires.)

FORM FOR MESSAGE, "VIA DIRECT CABLE" for Great Britain and Ireland, the Continent of Europe, Turkey, Egypt, Persia, India, Penang, Singapore, Cochin China, China, Japan, Java, Australia, New Zealand, and the East generally.

_____ Station _____ 187

Prefix _____ Code _____ Time. _____ No. of Message _____ By me _____ No. of Words. _____ Rec'd _____ m _____ 187 Finished _____ m Sent to _____ Station

Route VIA _____ Clerk. Counter Clerk _____ Special Instructions _____

CHARGES—Message $ _____ Repeating _____ Reply _____ To be paid out _____ Total $ _____

Please to telegraph the following MESSAGE, "VIA DIRECT CABLE," subject to the conditions printed on the back hereof, by which I agree to abide.

To _____ Address _____

"Via Direct Cable."

(You are requested before signing to read the Conditions on the back hereof.)

Signature, _____ *Address*, _____

The name of the place at which the Message originates is transmitted free of charge.

To prevent Mistakes attention is called to the importance of legible writing.

Messages for the DIRECT CABLE are also received at the undermentioned offices of the ATLANTIC & PACIFIC TELEGRAPH COMPANY.
MAIN OFFICE: 198 Broadway, 8 Broad St., 1265 Broadway, (Herald uptown office) 95 Franklin St., the St. Nicholas, Grand Central, New York and Windsor Hotels, The Hoffman House, and the Produce Exchange.

51

TELEGRAPHY!

J. F. GILLILAND & CO.'S

Complete Telegraph Apparatus,

For Schools, Amateurs and Private Lines.

A Complete Instrument  with Battery $3,50

THE above cut represents J. F. Gilliland & Co.'s Telegraph Instrument, which is the most complete both in parts and style of finish that has ever been offered to the public. This instrument is substantially made, finely finished, and put up in a neat box with battery, and is guaranteed as represented.

The sounder is made with two spools, and has an adjustment for the lever, so that it can be worked with either a strong or weak battery, an attachment which you will not find on other cheap instruments. The Key is the same style as that used by the *Western Union Company*, but of a miniature size, with good platina points which is a great deal easier to write with than the common spring brass key that is used on other cheap instruments.

Any one learning the art of Telegraphy on this instrument is capable of taking an office on any line.

The Battery furnished with this instrument is the most complete ever offered with any cheap instrument.

It is a Carbon Battery, being very powerful, and if kept open will retain its strength for four or five days without renewing.

The material used is the best that can be had. The best rolled sheet zinc, carbons and No. 1 porous cups, and for the convenience of students and those using them we have put post connections on the zinc and carbon, which facilitates the connecting of the wires, and making a better connection for the current.

In fact we have not overlooked a point, or spared any pains in making this Instrument what we justly claim, superior to all others.

A book of instructions will accompany each Instrument which *will enable anyone to send and receive a message at once, incredible as it may seem.* Also, how to run lines, set up Batteries and connect instruments and all necessary information pertaining to Telegraphing.

THE ART OF TELEGRAPHING.

YOUNG MEN AND YOUNG LADIES:

Your attention is directed to this fascinating study, *not only as a means of enjoyment* your leisure hours, but as an instructor. It cultivates the mind, teaching all those who practice it *to read, write and spell correctly*, and is considered by experts and those acquainted with the art, to be the best teacher in these branches that can be had.

Business men, men of leisure, and in fact everybody should give their attention to this beautiful study, for the time will soon come when everyone *must be able to Telegraph*, in order to be eligible to any important, lucrative and confidential position in mercantile life.

The above cut represents a party of ladies and children sending and receiving messages from their friends, and business men may comprehend at a glance how it may be similarly employed at the office; and *young* men may see how they may converse with their companions in different parts of the city or country with the electric current as a medium, learning at the same time a business which will bring them a good livelihood, and is considered by all to be the greatest of studies and indispensible to business.

SEND YOUR ORDERS TO:

J. F. GILLILAND & CO.

Manufacturers and Dealers in Telegraph Machinery and Supplies,

N. W. Cor. Fifth and Elm Sts., CINCINNATI, OHIO.

Goods sent to any part of the country C. O. D., or on receipt of price.

[illegible]

2 C

1 mile higher

4 C

1 mile higher

5 C

1 mile higher

6 C

1 higher

8 C Edison

9 C Same

10 C Same

11 C Edison higher still

12 C Same high note

13 C Edison [illegible]

14 C Same

15 C Same

16 C Prevailing longest lake crack of day –

17 C Also

+ 18 C [illegible]

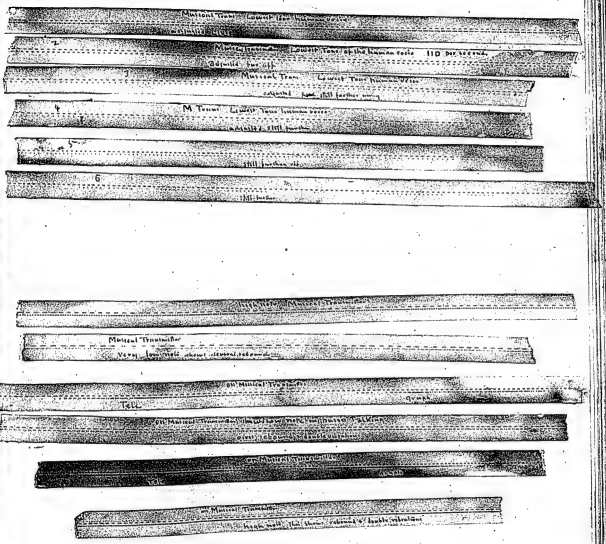
Minimal Thermocline [illegible]

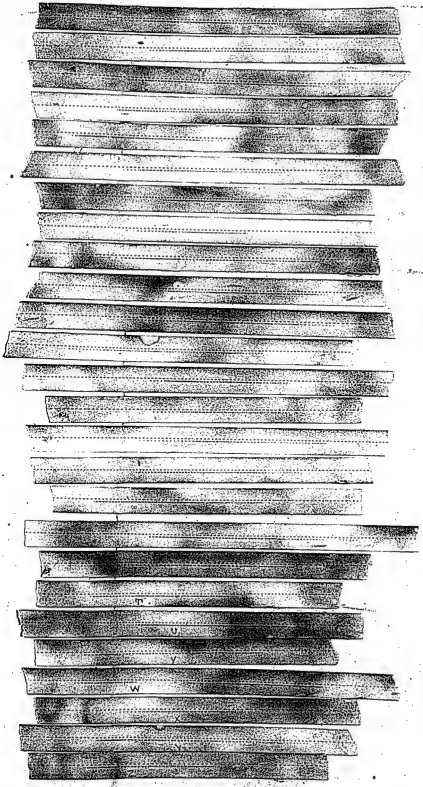
[illegible]

[illegible]

[illegible]

[illegible]


Mutual Trans
Lower Tone
Mutual Trans
Lower Tone of the human voice
110 Per second
Mutual Trans
Lower Tone
M Trans
Lower Tone human voice
Mutual Transmitter
Mutual Transmitter
Mutual Transmitter
Mutual Transmitter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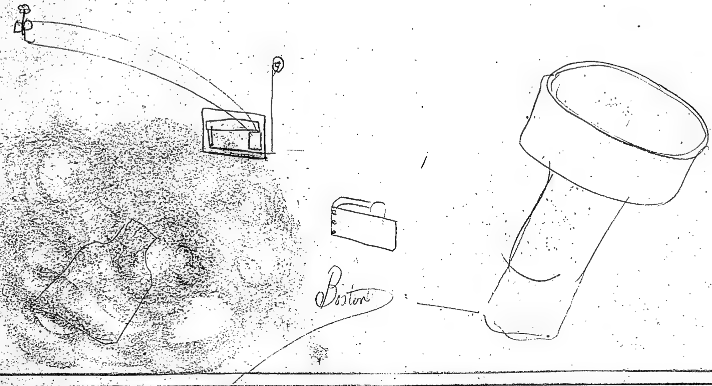

Boston

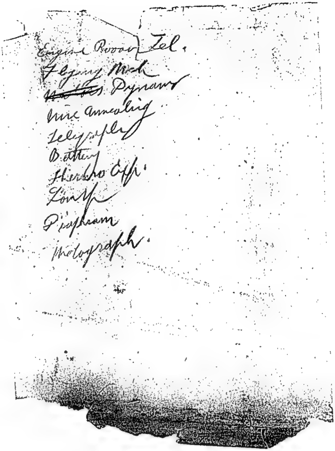
... average ... feet, worth ... Arnold granted a remand, and ... in £200 for his reappearance."

... FIRST OVERLAND TELEGRAPH IN CHINA.

...he *Pall Mall Gazette* says: The construc... of the first overland telegraph in China has ...een attended with considerable difficulties. It was when the Formosan affair became threatening that the Viceroy of Fukien made arrangements with the Great Northern Telegraph Company for the construction of a line from Amoy to his Yamun at Fuhchow. But no sooner was the first portion completed than the natives discovered that the erection of the poles interfered with the benign influences of the Fung-shin of the district. They therefore turned out "in their thousands" and uprooted the poles. Upon this the company appealed to the native authorities for protection, and ultimately the matter was referred to Prince Kung and the foreign Ministers at Peking. The result of this diplomatic interference has been that a new contract has been made with the Great Northern Telegraph Company, under the terms of which the Viceroy agrees to pay the company $154,500, or upward of £30,000, for the construction of the line between Amoy and Fuhchow, a distance of about 160 miles, and a further annual sum of $24,000 for its maintenance. We imagine that the company can have nothing to complain of in these terms. The Mandarins further bind themselves to give full protection to the company's staff and material, and to be responsible for any theft that may be committed on the property of the company, or for any delay that may be occasioned by unlawful interference on the part of the natives. The company, on their part, agree to make and to keep in repair the line, and to instruct Chinese pupils appointed by the Government in the art of telegraphy.

CONVICTS IN GEORGIA.

Col. John T. Brown, keeper of the Penitentiary of Georgia, has supplied the Atlanta *Herald* with the following information: The whole num... ... only



Engine Room Tel.
Flying Mch
~~[illegible]~~ Dynamo
Wire Annealing
Telegraphs
Battery
Electro Apps
Lamps
Phonogram
Photograph.

[ITEM FOUND IN BOOK]

Laboratory Notebook, Cat. 30,095

This notebook contains only a few dated entries, covering the period March 1874-January 1875. Most of the entries are by Charles Batchelor and are primarily calculations and drawings of component parts of instruments relating to the domestic, automatic, and printing telegraph systems. In the middle of the volume are blue stains, apparently made by the disks used in Edison's recording telegraphs. A list of six names and addresses can be found near the end of the volume. The cover is labeled "Vol. 5." The book contains approximately 200 unnumbered pages. Many leaves have been torn out.

Vol 5

Parts wanted for copying Lind

50	small 10 tooth pinion		10 Finished
50	large 14 = =	= Mon	10
50	= = 10 = =	= =	10
100	small shafts	=	
50	drum = =	Spr	
50	second wheel shafts	Mon	
50	drums		10
50	80 tooth wheel		
50	100 = = wheel		
50	60 = =		
50	escape wheels		
50	pallets		
60	jam nuts	Mon	
160	girders		
50	paper drums		
50	feed rollers		
60	shafers		
60	sticks		
~~60~~	~~= springs~~		60
50	dubble taper pivots		
50	paper feed holders		
50	long shelder screws for paper feed		Mon
50	short = =		Mon
50	feed levers		
120	frames		
480	5/32 screw		Mon
120	45 = =		Mon

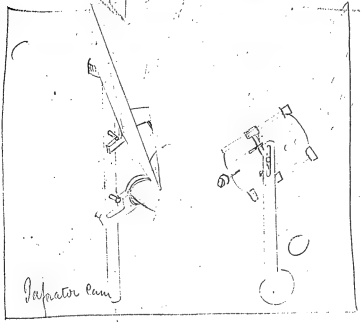
Switch

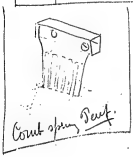
Switch stud with shelds 60 wanted 87 received

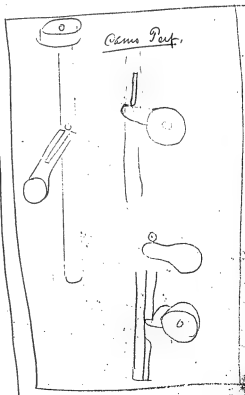
= = with out 60 =

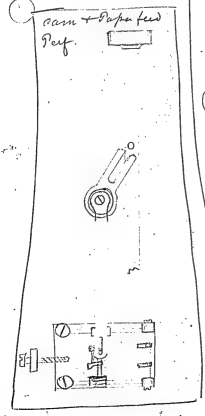
Rubber bairs 30 w 30 F

Binding posts 120 w

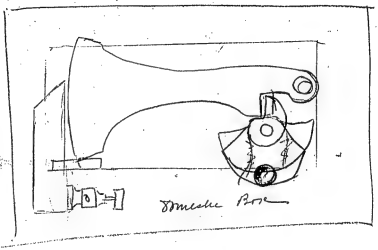

Separator Cam

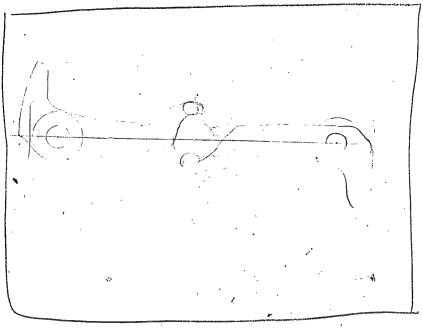

Count spring Perf.

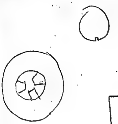

Cams Perf.

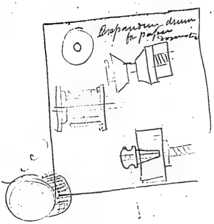

Cam + Paper feed
Perf.

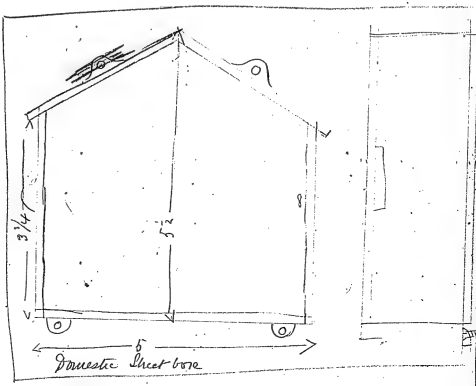
$6 = \frac{12\frac{4}{4}}{744}$

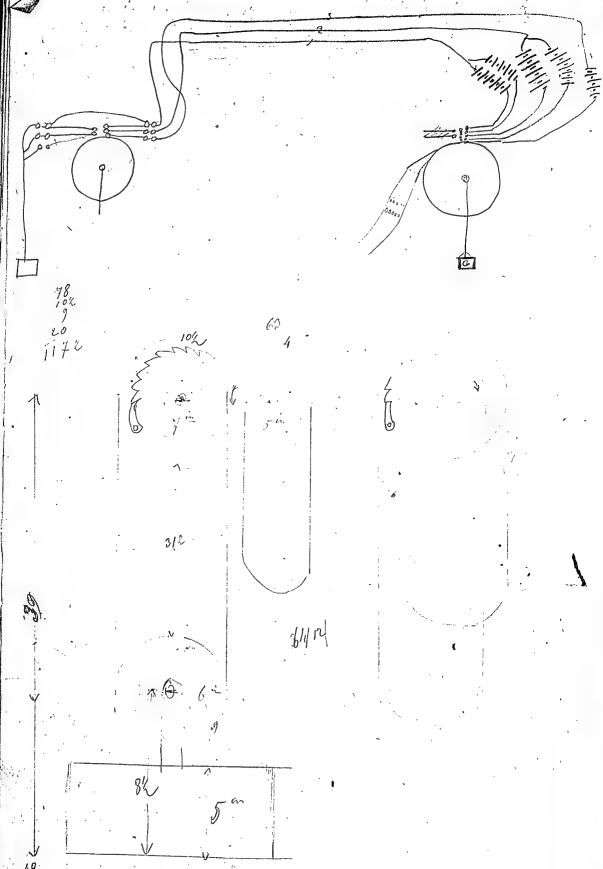







Expanding drum
for paper
Domestic


3 1/4
5 1/2
5
Domestic Sheet-iron



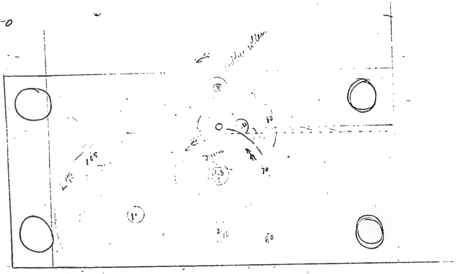
Stock printer

1.1 inches & a word
20 feet of paper per minute
would give us about 225 words.

Regular run slow
No 1 2 minutes per word.

1 — 1 Revolution
2 — 10½ Revol.
3 — 84 [illegible]

3-0-0



5-0.

3 .5-00.

.225
5
1125.

$1 = \frac{2}{10\frac{1}{2}}$ $\frac{3}{84}$ $\frac{4}{588}$ $\frac{5}{3528}$

1 2 3 4 5
1 — 10½ 84. 672 5376

10/105
10

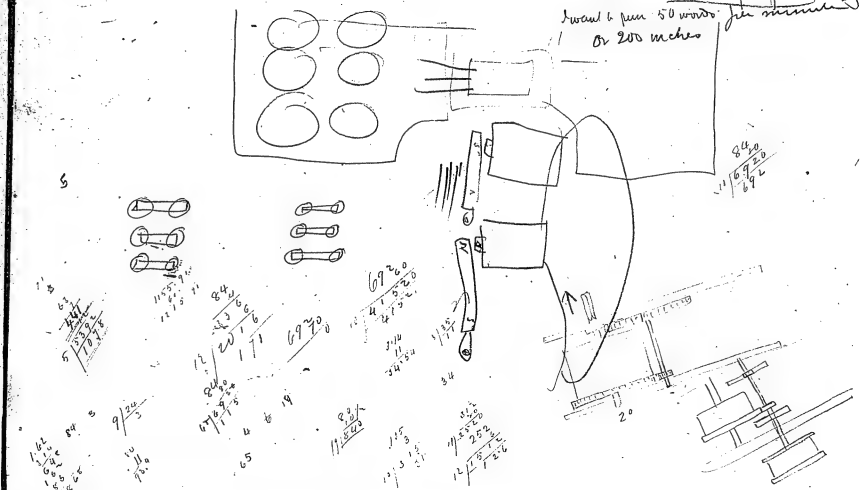
672
5376

672
4704

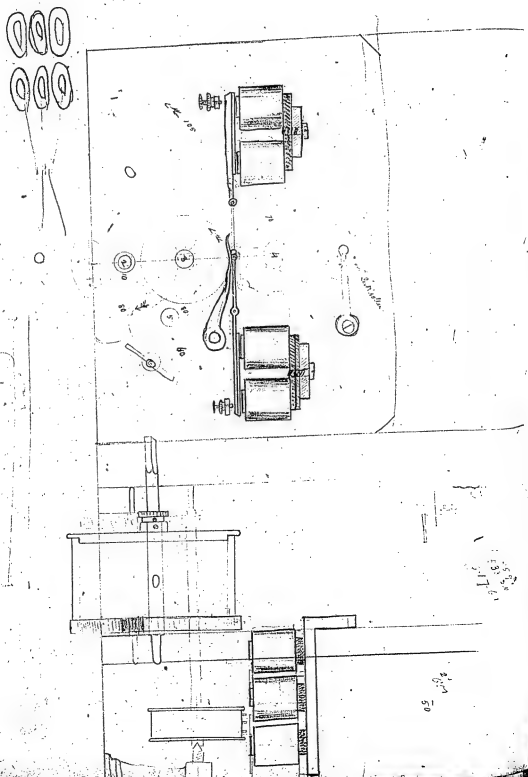
84
672

1 5/8

4 inches equals 1 letter of
Morse letter perforation
Average 6 pen 50 words per minute
1 or 200 inches

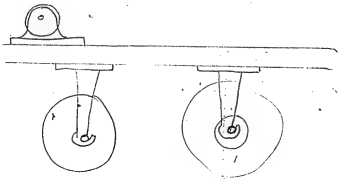


Edison's New Stock Printer

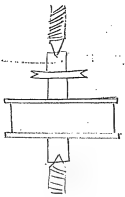


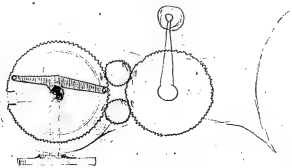
Governor for. Aut. Cutter

1 = 200
200
11/6 0 0 0
5·46

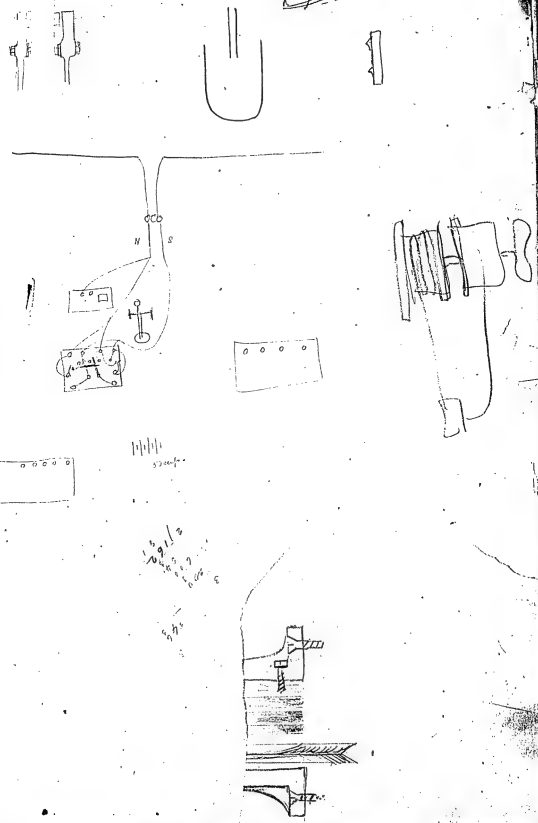


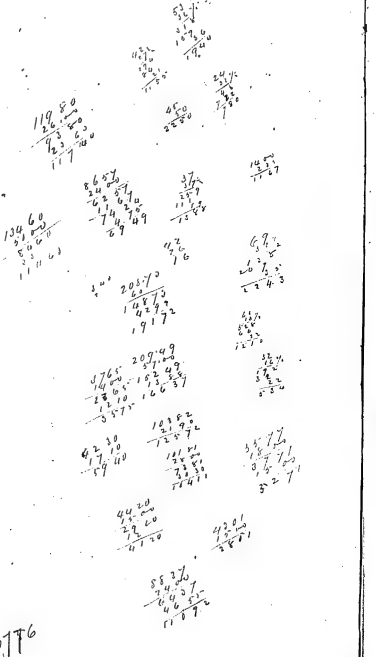
1 = 200 with 5·70
2 = 5·4 — 11·05 3.

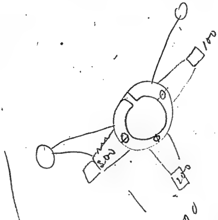




Shop use ok







2000 100

$\frac{2000 \times 100}{2000 + 100} = \frac{200000}{2100} =$

3|6000 2000 6666 5.3

21|2000(95.24 189 110 105 50 42 80

2000 × 5 = 10000 4.98

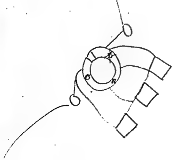
2005|10000(4.98 8020 19800 18040 17600 16040

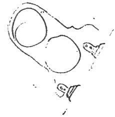
95.24

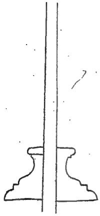
17|100

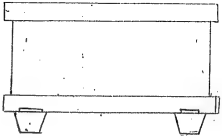
24|

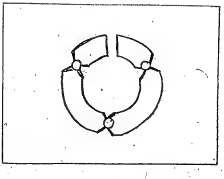
85





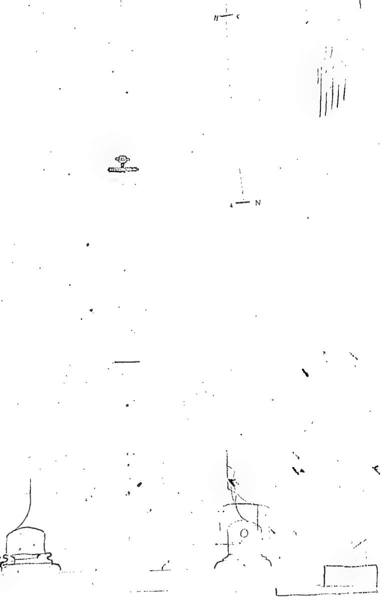


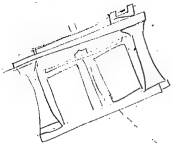


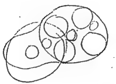


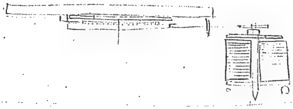
85

191 191 155



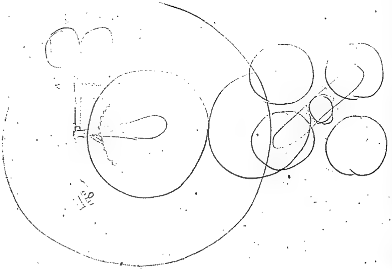


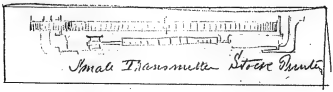




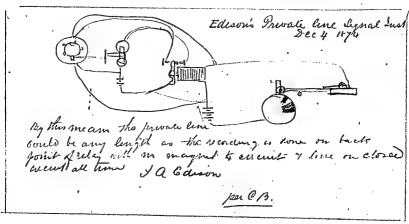
18
2
3
30
17

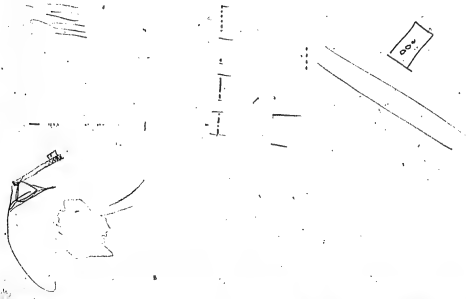
260

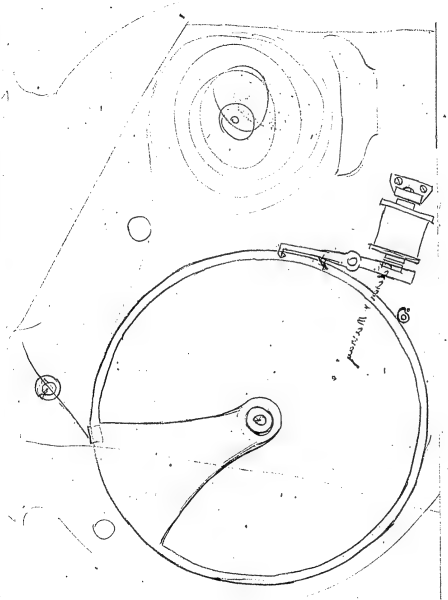




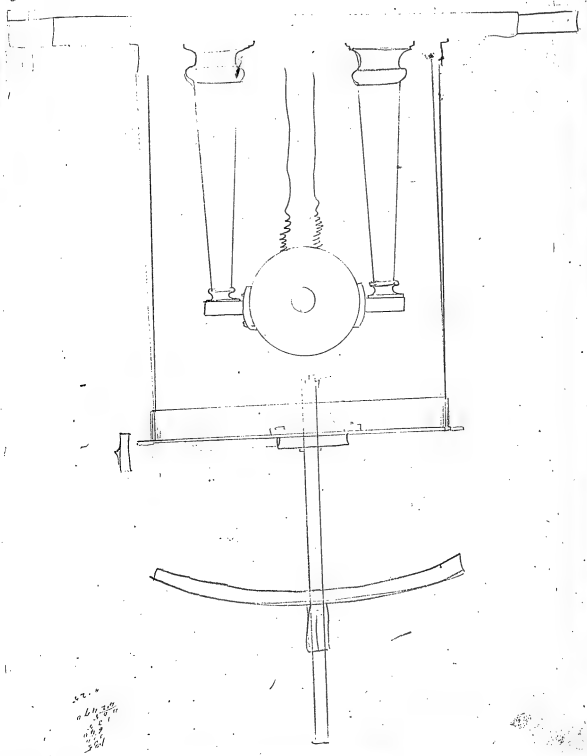
Small Transmitter Stock Quotations

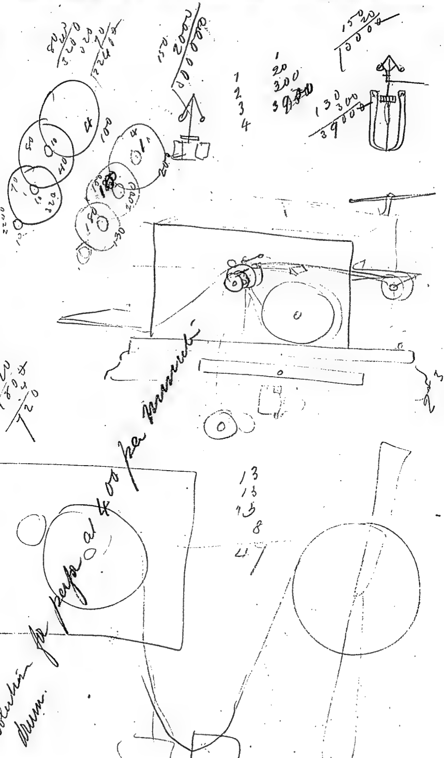




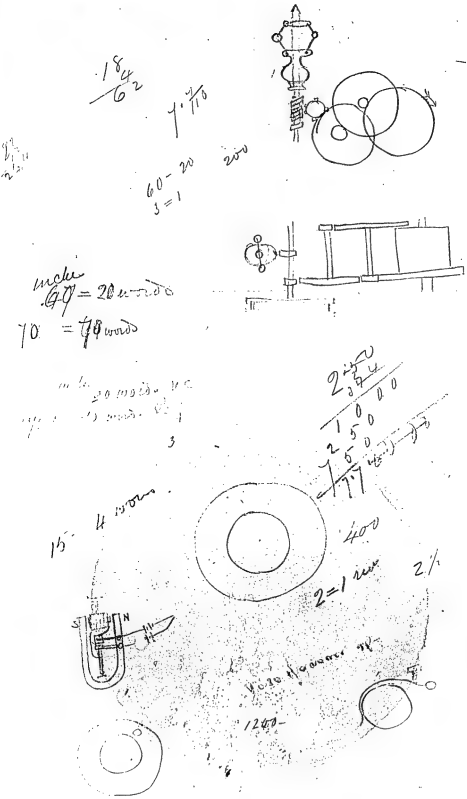


2.





225 revolution for page at 1400 per minute
3+ drum.


60 - 20 200
3 = 1
inches
GY = 20 words
70 = 78 words
2250
1000
1500
2500
400
2 = 1 ratio
2/1
1200

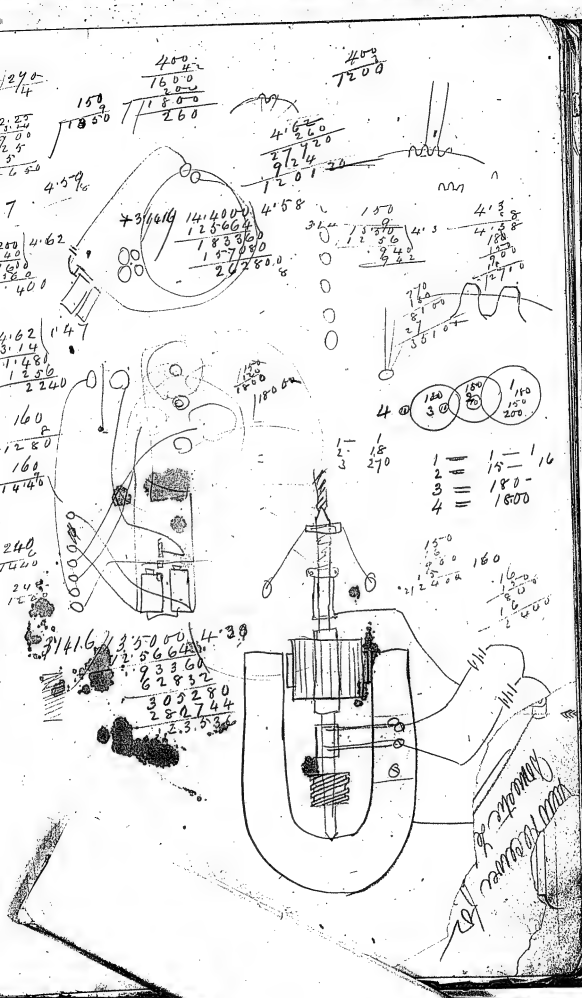
60 inches = 20 words recev. | Perf drum 2¼ inch
270 inch = 70 words perf.

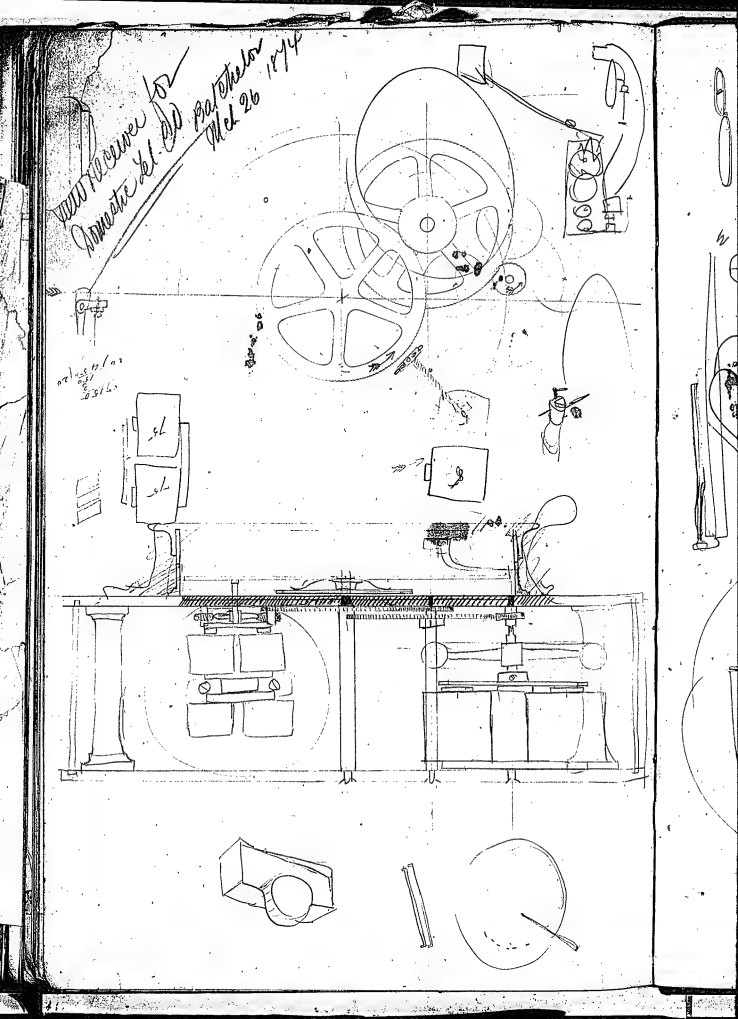
42 ~~5~~ inches = 1 word of Perf.
3 inches = 1 word of Rec

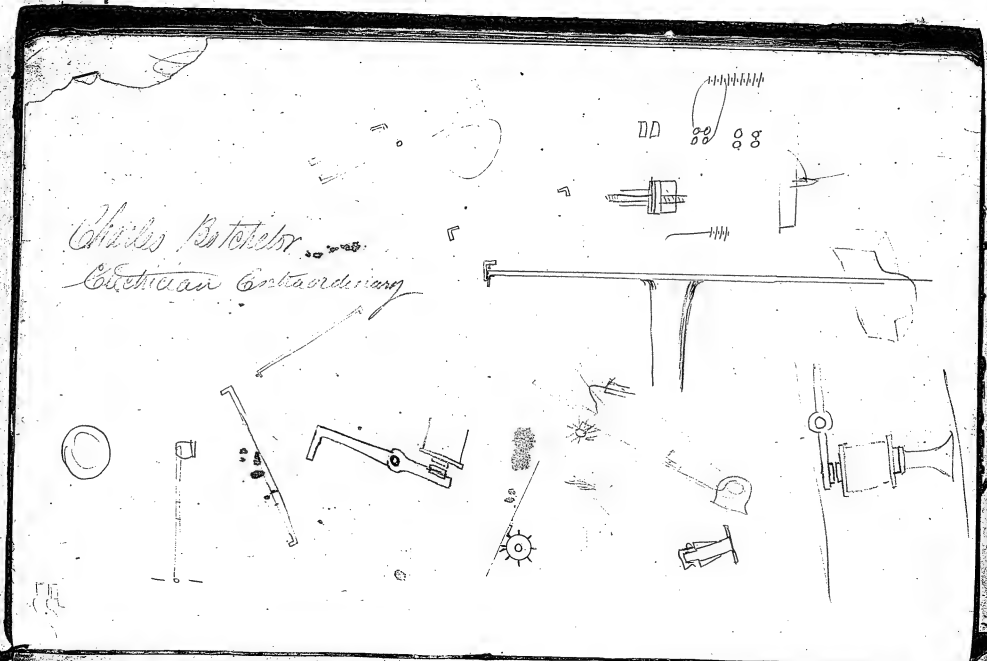
400 words per minute 2¼ drum Perf. 7 inch per revolution 4½ per word.
— 260 revolutions

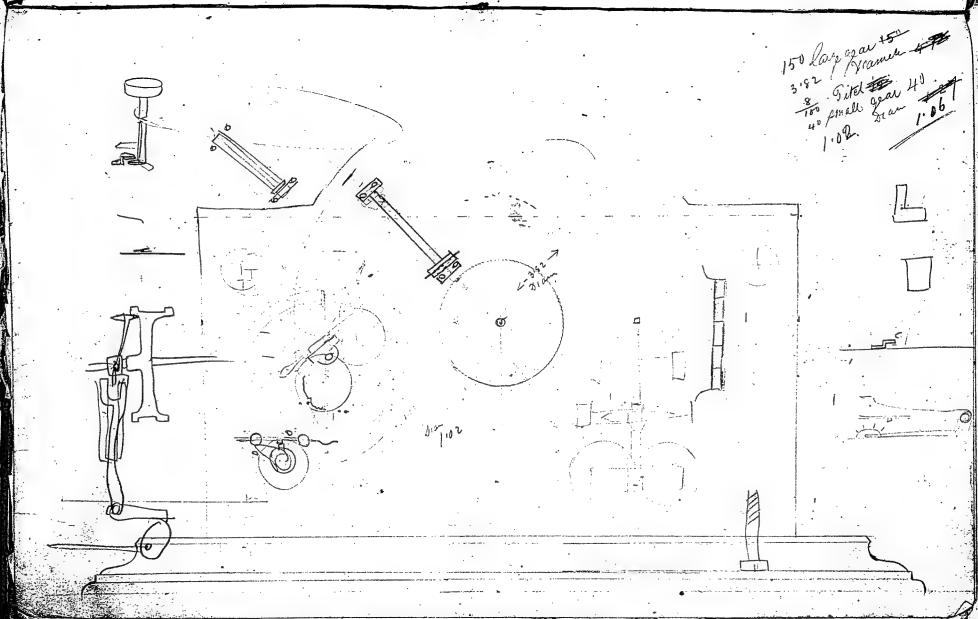
400 words per minute at 260 rev, 3 in per word per = 1·47 diam of drum

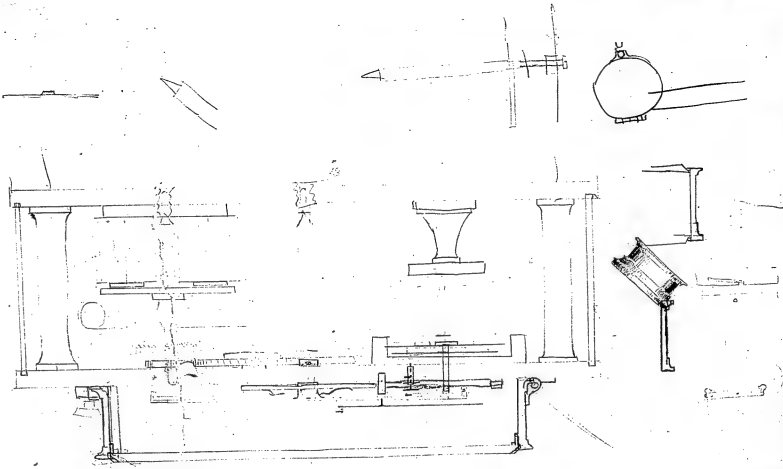
				Drum on ale
1 gear. 1 turn per minute	160 tooth	19 pitch	diam 4·59	4·67
2 gear. 16 " "	150 ± 09 pitch		4·30	4·38
3 " 240 "				
4 "				

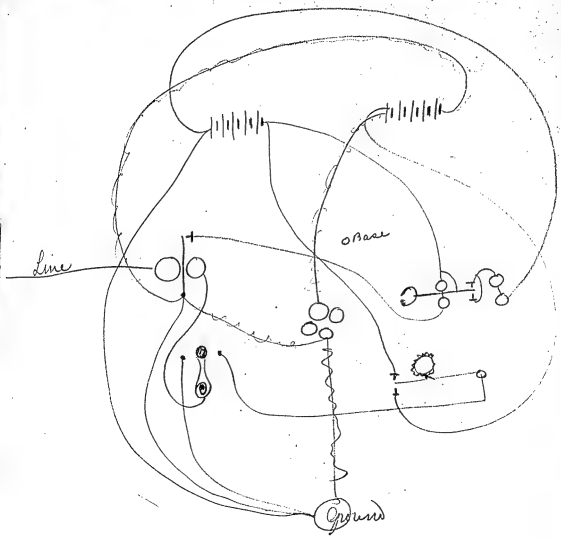



Receiver for
Rotate at 200 Barometer
Oct 26 1874


Charles Batchelor
Electrician Extraordinary


150 Lazy gear 150
3.82 Pinion
8/100
40 Small gear 40
1.06
1.02
3.82
31
1.02

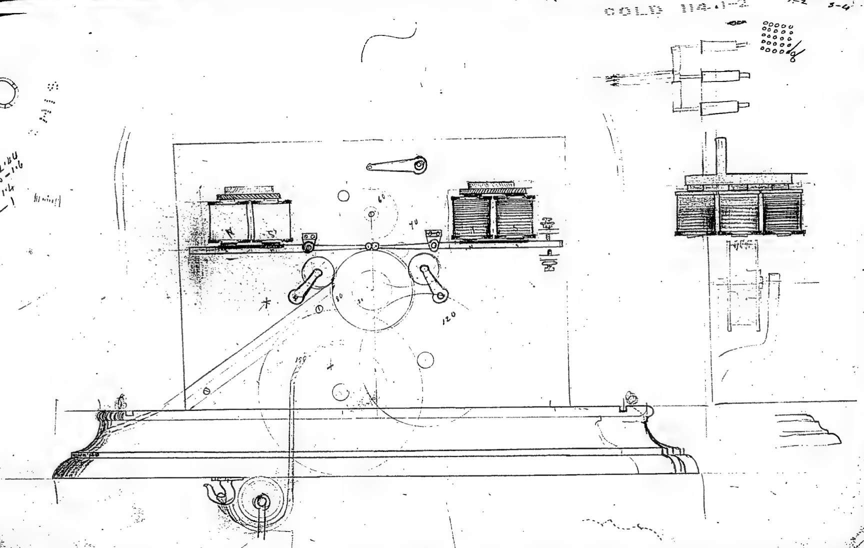



Line
Base
Ground

GOLD 114-1-2

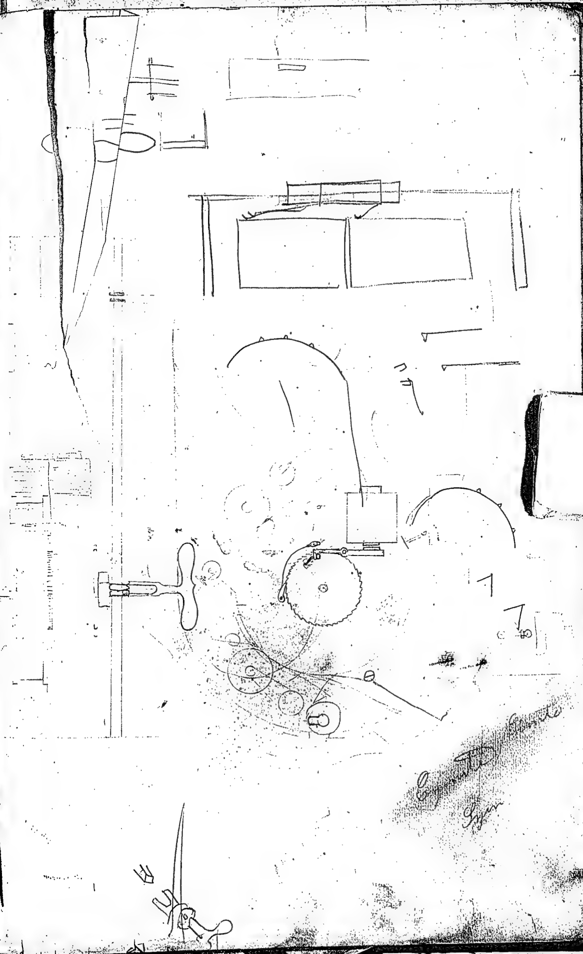
1·65 = 1 word
Drum. Diam.

1 = 150 Iron 2·44
2 = 120 Drm 80 – 1·6
3 = 30 – 1·4
4 – 70 60 – 1
5
6



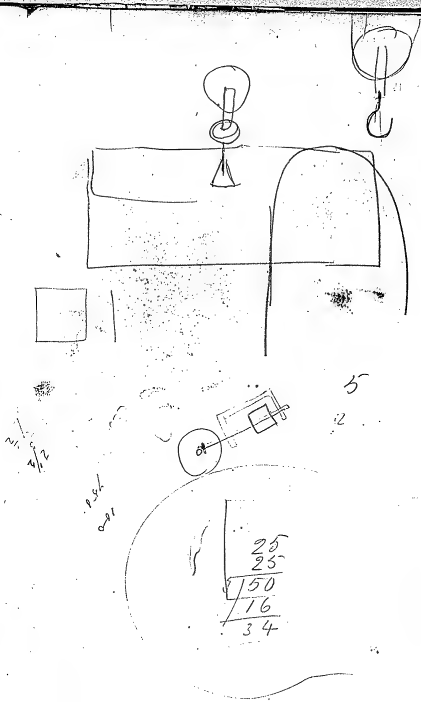
[ITEM FOUND IN BOOK]

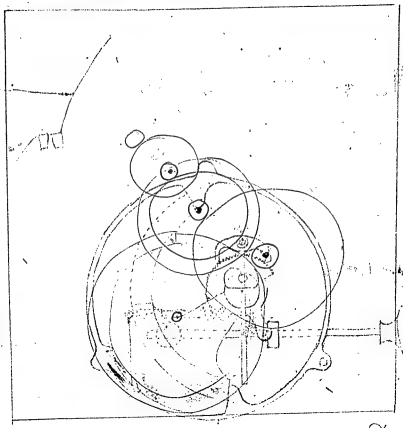
19 Adj. thumb screw
80 Paper guide screw.
22 Bushings
16 Check posts
Screw pack 33
40 Posts & screws #11
200 64 Washers.



[illegible]

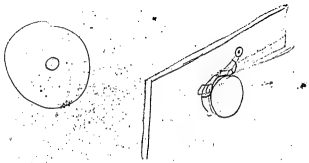
Gyn


25
25
50
16
34
5
2
100
750
2 1/2
1/2

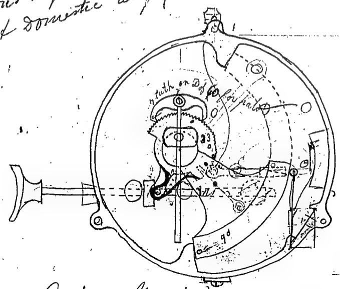


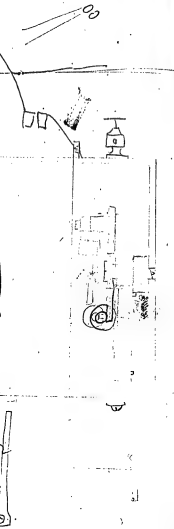
100 mm

Drum 9" diam
1/2 under + wood



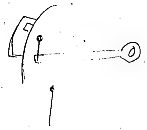
Edisons Signal box for
Fire & domestic telegraphing

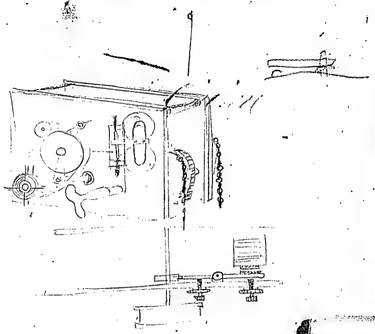




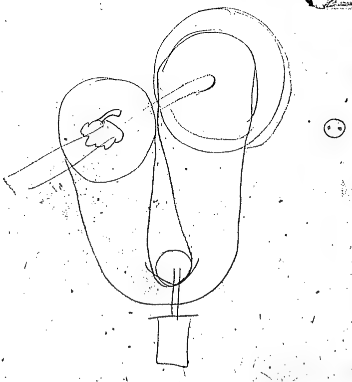
Designed Nov 22nd 1874
Chas Batchelor

20/120

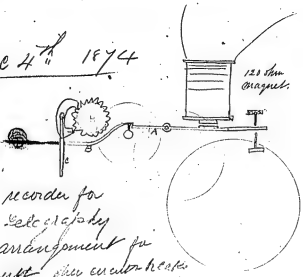




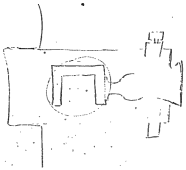
7/8 3/8



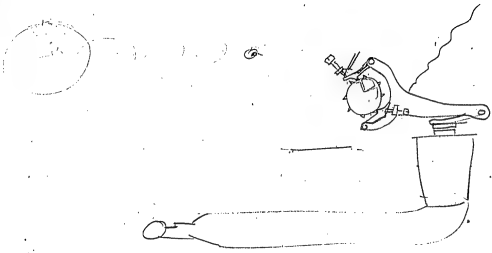
Dec 4th 1874

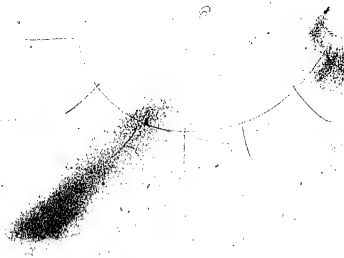


Edison's recorder for
Domestic telegraphy
release arrangement for
closed circuit when circuit breaks
the lever A trips up armature arm B & releases
C



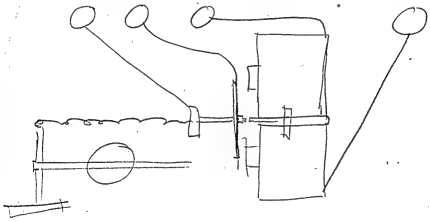
54
22
5
81



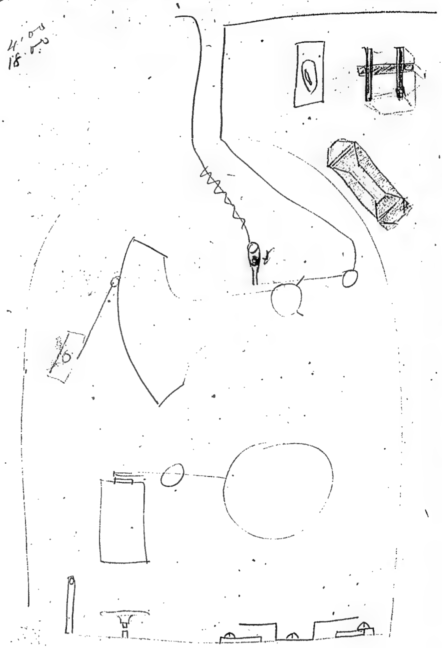


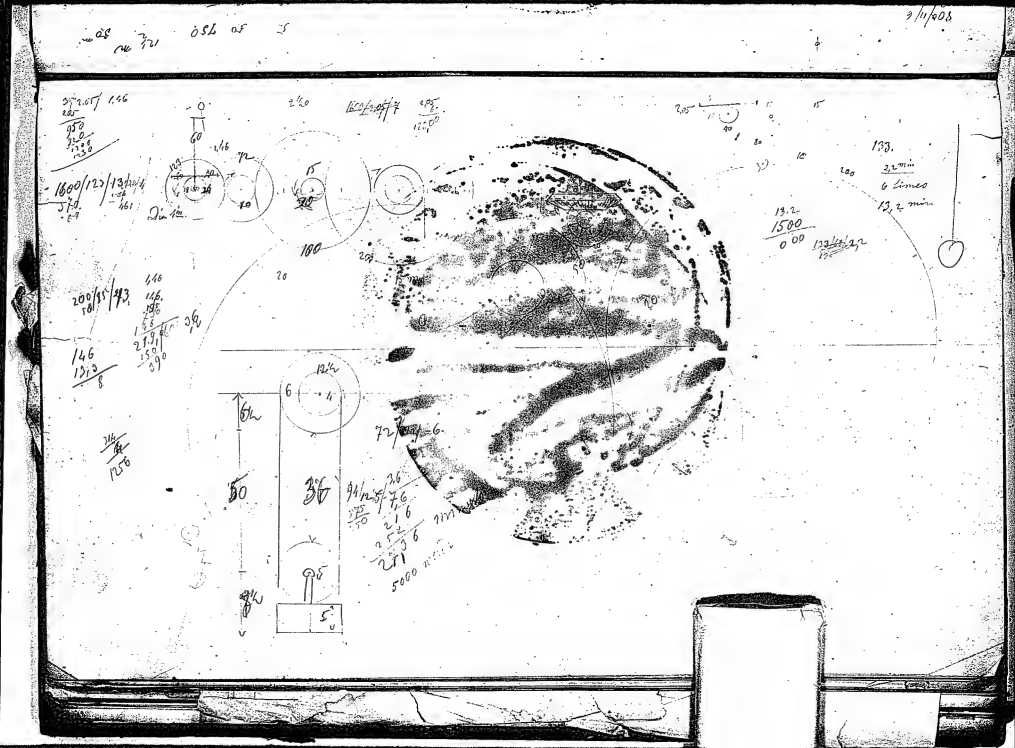
Dec 18 1874

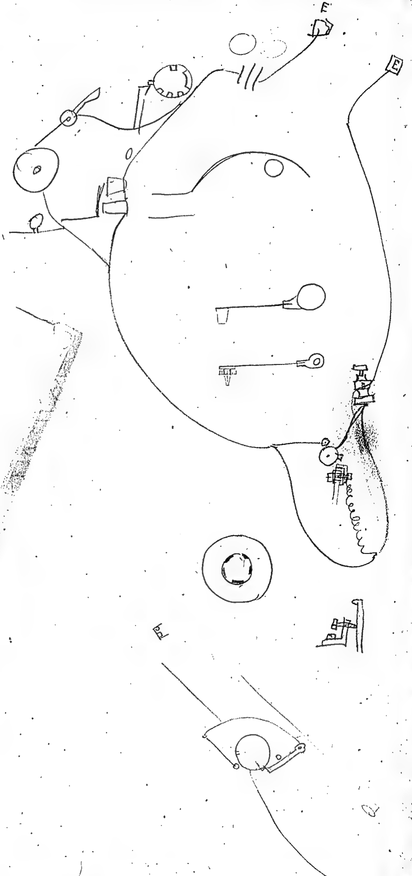
Connections for Short cor Quadruplex Relay



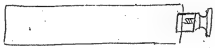
30 h 40/60. 4' 0"
18. 0"






F
E

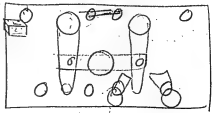
4 plates of each metal 4" long + 1" wide
with binding post on



Iron
Brass
Copper
Tin
Zinc
Platina
Nickel
Silver
German silver
Lead
Gold
Magnesium

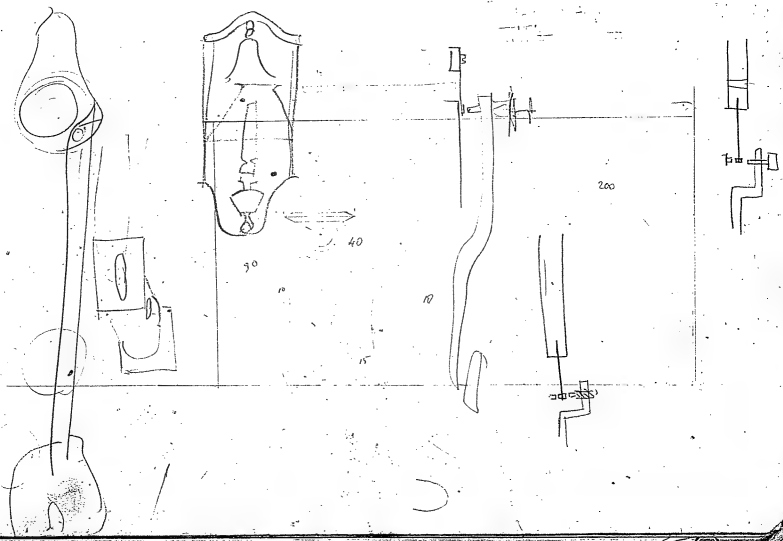
8 Keys on bases weighted
4 Keys on bases weighted, tackpointed.

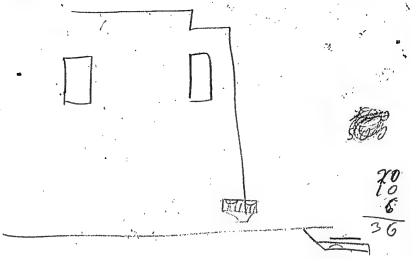
1 Double switch for Armature.



$2.00

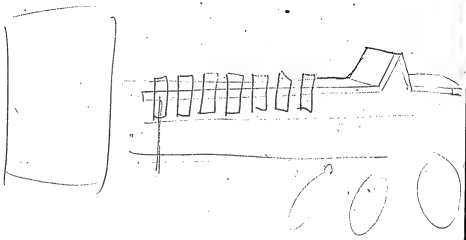
1 Paper Cutter to take 1" 3/4 or 1/2" paper

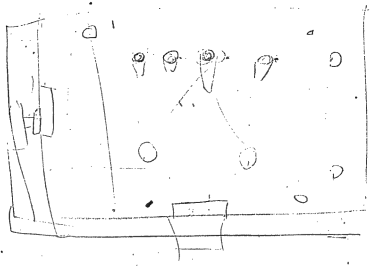

40
90
10
15
200



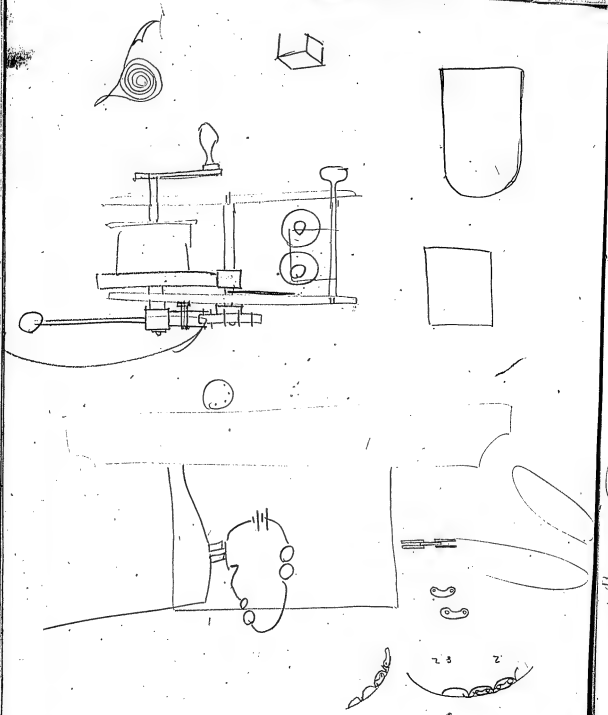
70
10
6
36

400
30
5
150

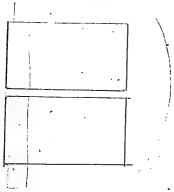




Edisons New Improved Perforator



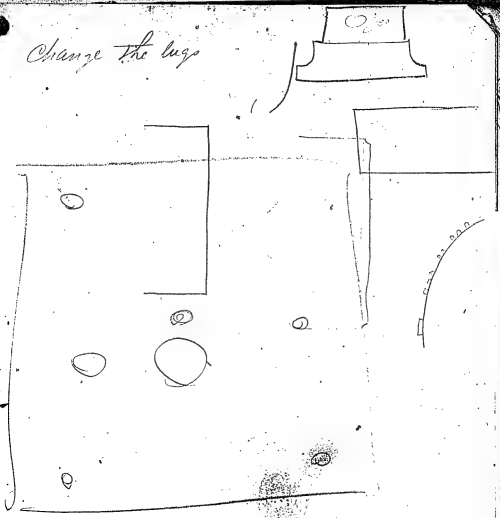
Core 2 3/16



1211

150
39

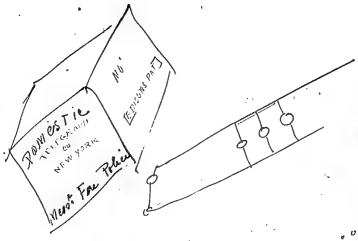
Change the lugs

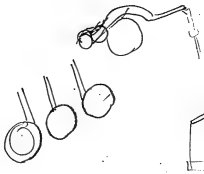


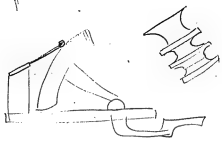
THE DOMESTIC TELEGRAPH CO.

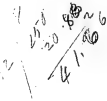
PUSH IN & LET GO

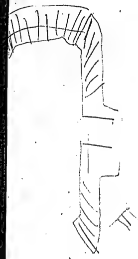
ONCE FOR MESSINGER
TWICE FOR POLICEMAN
THREE TIMES FOR FIRE

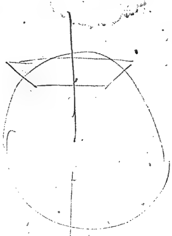

TOWOSTIE
AVENUE CAMP
OF
NEW YORK
No
Mrs Fan Phei











5.375
3.141
16.882875
16.9

128 | 16.888
.14

110 | 5.375
.0044

128 | 5.375
.0448

14
12
16.8

128 | 5.375
.044

44
53.7
100000

4 | 5.375
1.344

5/8

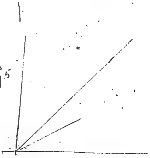
4 | 42
11

3/8
8.125

125 | 344
250
94

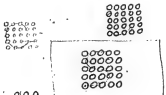
8 | 1000
125
3
375

134

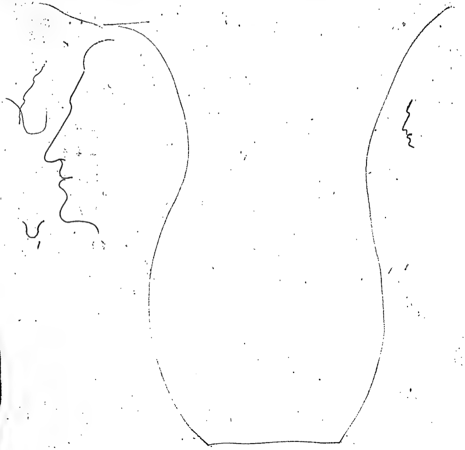


Roman perforators

1 line I.
2
3
4 — BCDEFGHJKLOPQRSU
5 — AMNTVWXYZ9



A cutaway 2-3-4-5-6-7-9-10-11-12-15-16-17-19-20-21-22-23-24
B " " 7-9-12-11-16-18-20-21-22-23-24-25
C " " 1-5-7-8-9-11-12-14-16-18-20-21-22-23-24-25
D — 7-8-9-11-12-14-16-20-21-22-23-24-25
E — 7-9-11-12-17-18-19-21-22-23-24-25
F — 6-7-9-11-12-15-17-18-19-20-21-22-23-24-25
G — 1-5-7-8-9-11-12-14-16-18-21-22-23-24-25
H — 6-7-9-10-11-12-13-15-21-22-23-24-25
I — 6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25
J — 1-3-4-5-7-8-9-10-11-12-13-14-20-21-22-23-24-25
K — 6-7-9-10-13-14-15-17-18-19-21-22-23-24-25
L — 7-8-9-10-11-12-13-14-16-17-18-19-21-22-23-24-25
M — 6-7-8-10-11-12-13-15-16-18-19-20
N — 6-7-8-10-11-12-13-15-16-17-18-20
O — 1-5-7-8-9-11-12-14-16-20-21-22-23-24-25
P — 6-7-9-11-12-15-16-18-19-20-21-22-23-24-25
Q — 1-5-7-8-9-12-14-16-21-22-23-24-25
R — 6-7-9-11-12-15-16-18-21-22-23-24-25
S — 2-8-5-7-9-11-12-17-18-20-21-22-23-24-25
T — 1-2-3-4-6-7-8-9-17-18-19-20-22-23-24-25
U — 1-7-8-9-10-11-12-13-14-20-21-22-23-24-25
V — 1-2-3-4-6-7-9-10-11-12-13-14-16-17-19-20-22-23-24-25
W — 6-8-9-10-11-12-13-15-16-17-18-20
X — 2-3-4-6-8-10-11-12-13-15-16-18-20-22-23-24
Y — 1-2-3-4-6-7-8-10-11-12-13-16-18-19-20-22-23-24-25
Z — 2-3-4-7-8-9-11-12-18-19-22-23-24
8 — 12-4-5-6-7-9-10-11-12-13-15-16-17-19-20-21-22-24-25



5
.65
3.25

.32
5
1.60

14.00
3.60
3.00
3.25
12.00
35.85

48

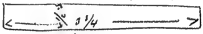
1611
5.65
1046

45
8
360

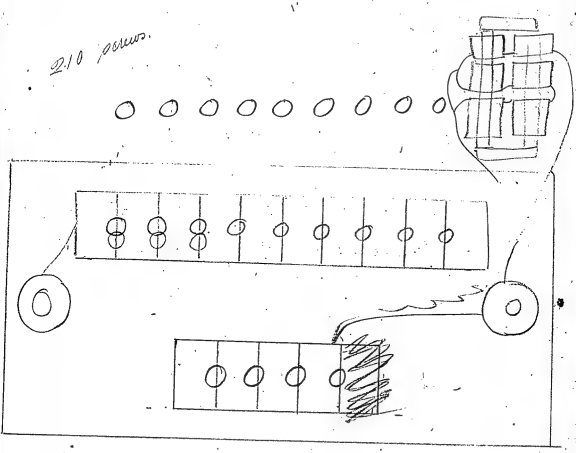
A cutaw
B " "
C " "
D ——
E ——
F ——
G ——
H ——
I ——
J - 1-
K — 6-
L — 7-
M — 6 -
N - 6 -
O — 1 -
P — 6 -
Q - 1 - 5
R — 6 - 7
S — 2 - 8
T — 1 - 2 -
U — 1 - 7
V 1 - 2 -
W 6 - 8 -
X 2 - 3 -
Y 1 - 2 - 3
Z 2 - 3 -
& 12-4-5

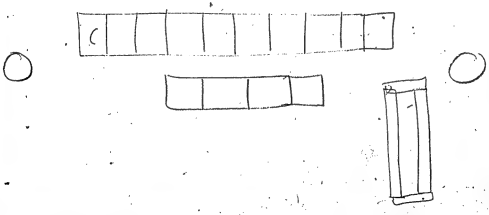
2 Lending shunt

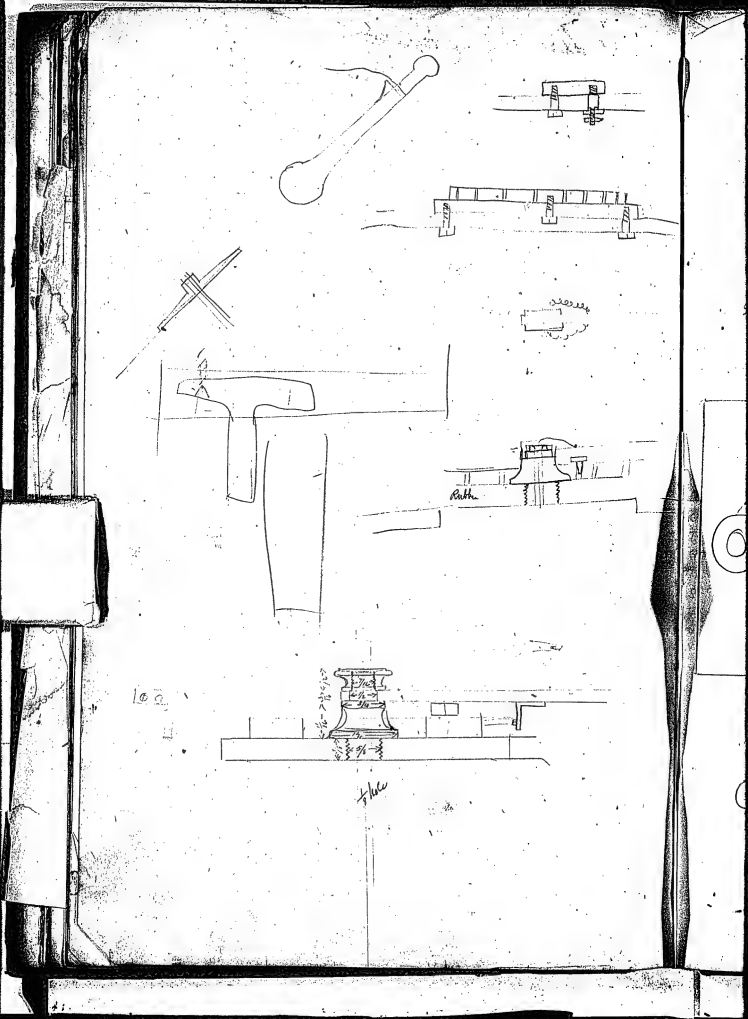
B5
24

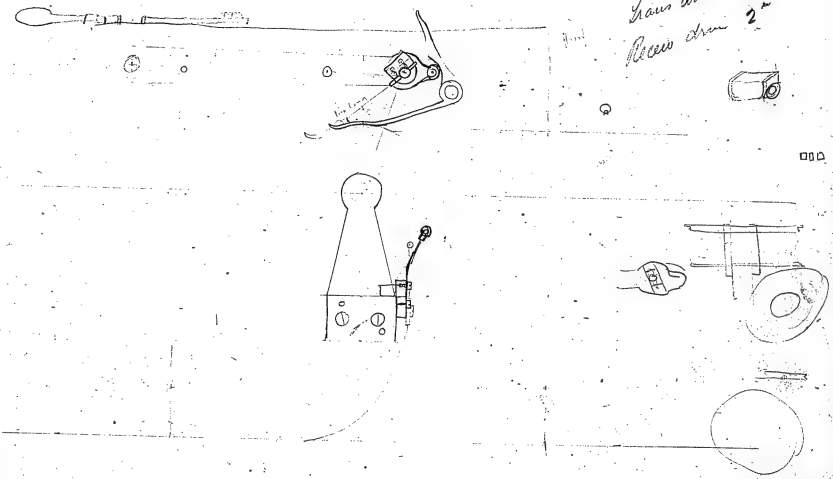


210 screws.

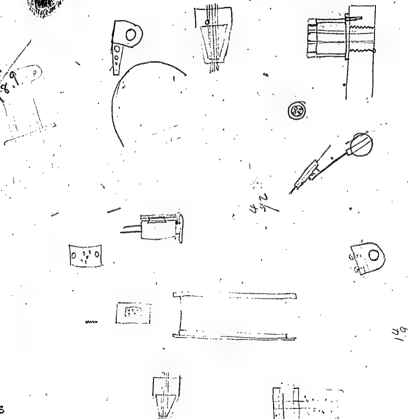





Rubber
Plate

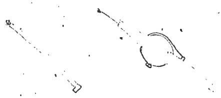

Gear drum 2 1/2
Screw drum 2"

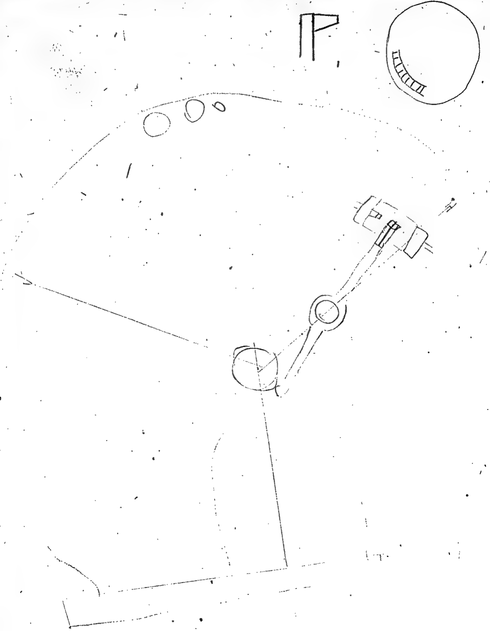
94/6.1
-5u



RL — 17 8.
9C
Zinc - 54
2'5-0 Cwh. 35
Tin BR. 25
Coil Clamp. 25
Coil Sub

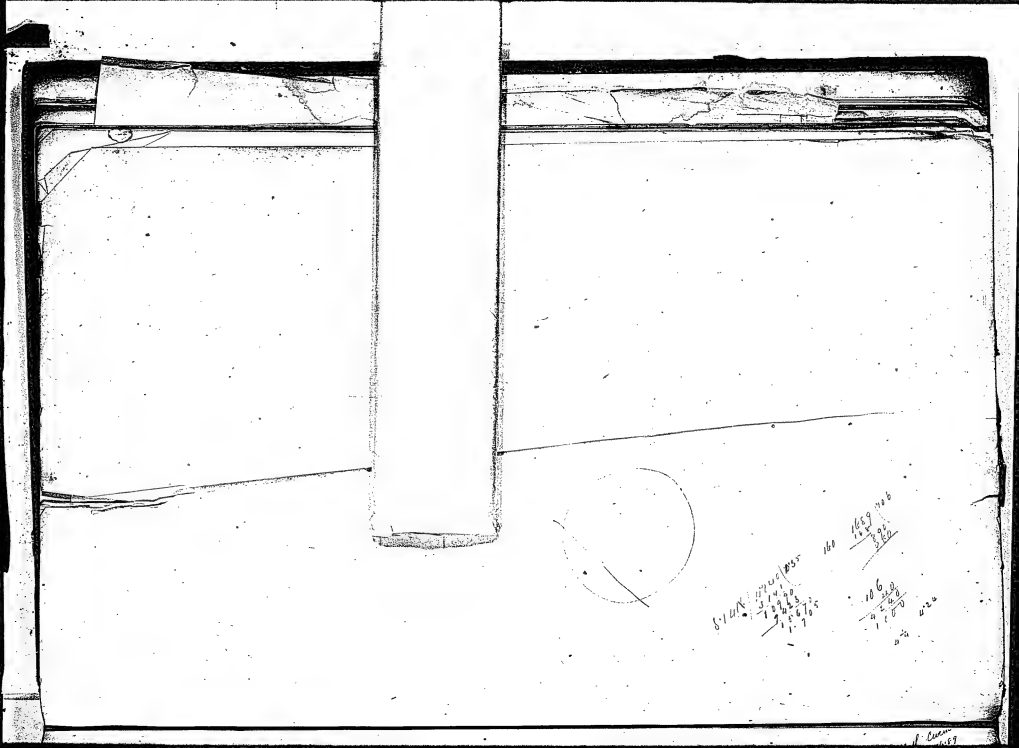
2·13
3·14
8 1 2
2 0 5
6 0·9
6·3 7
3 1

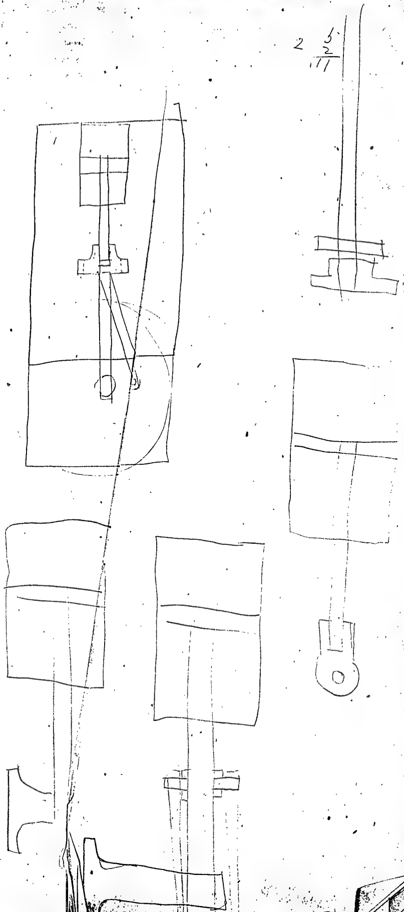




2 Wire Yeoman

	Diam	Pitch	Circum
Large gear	5.35	120	16.59
Small ditto	1	30	4.22

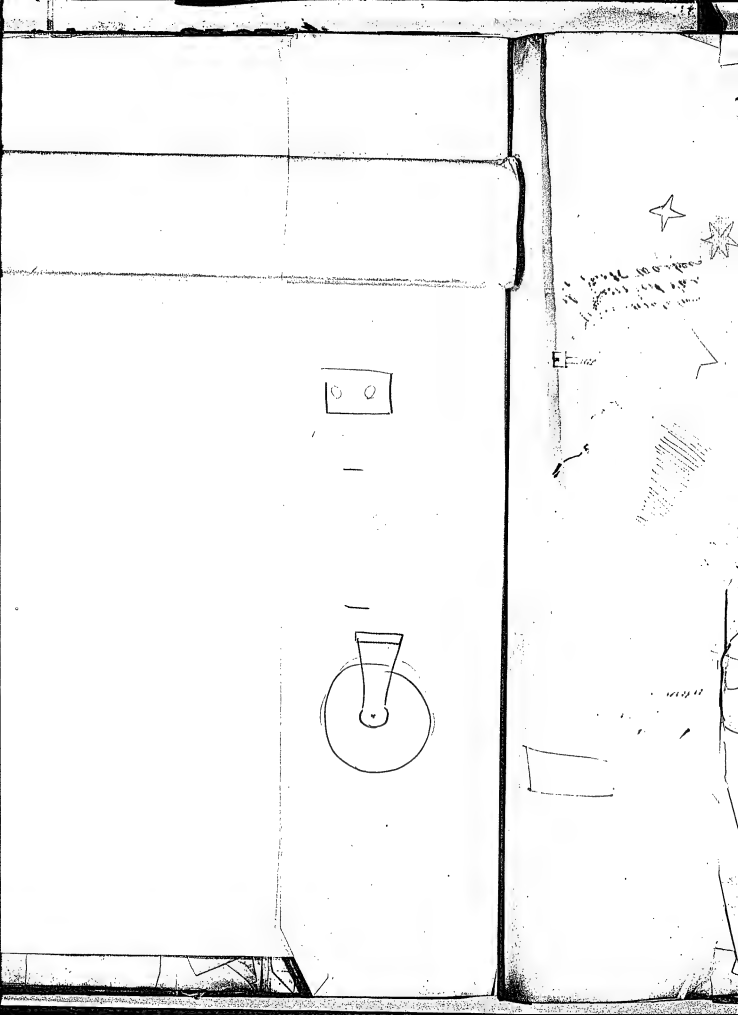




2

5
2
11

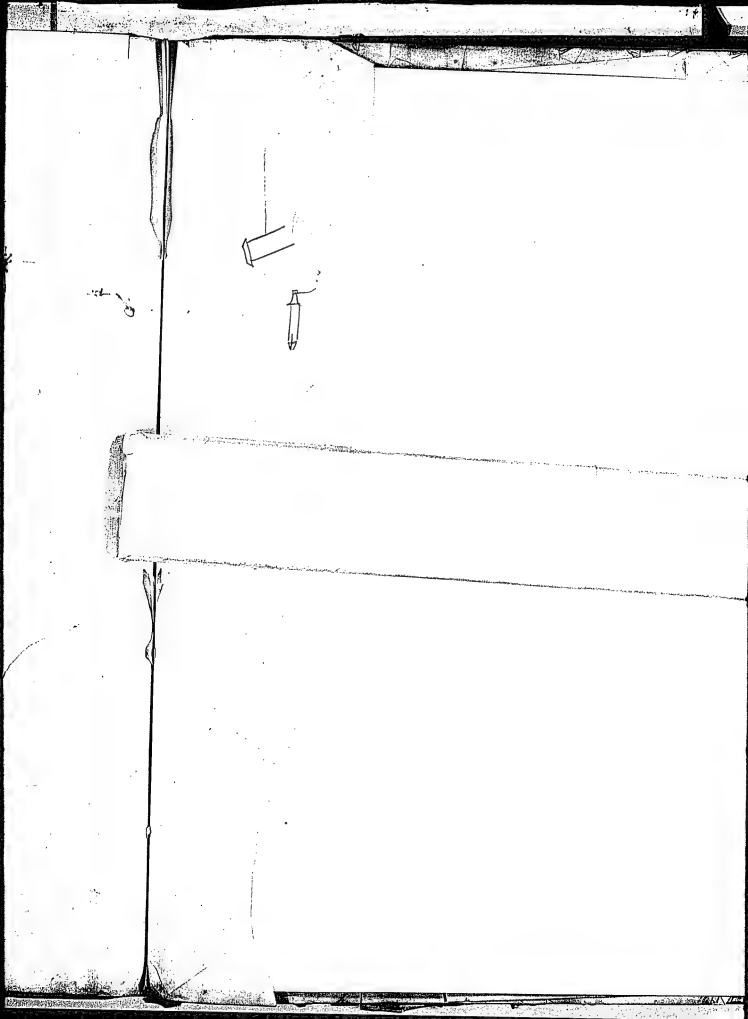
Otrau	6	10
Smity	10	10
Bauer	8	2
Lebeau	15	
Mulset	2	
	42	22
		22
		66

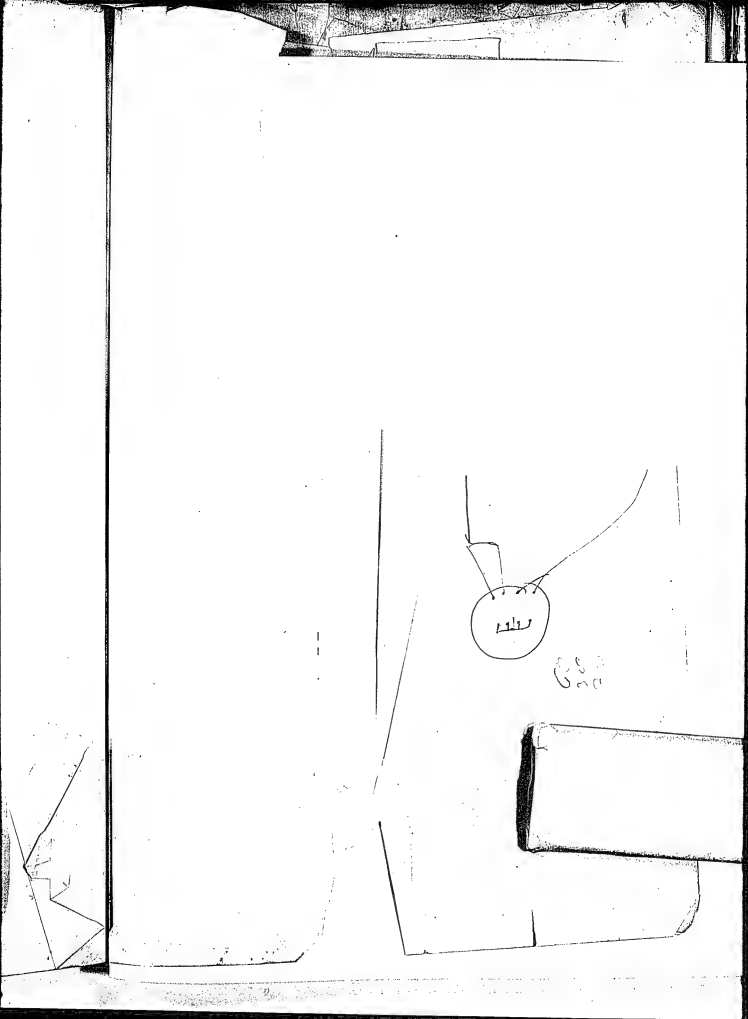


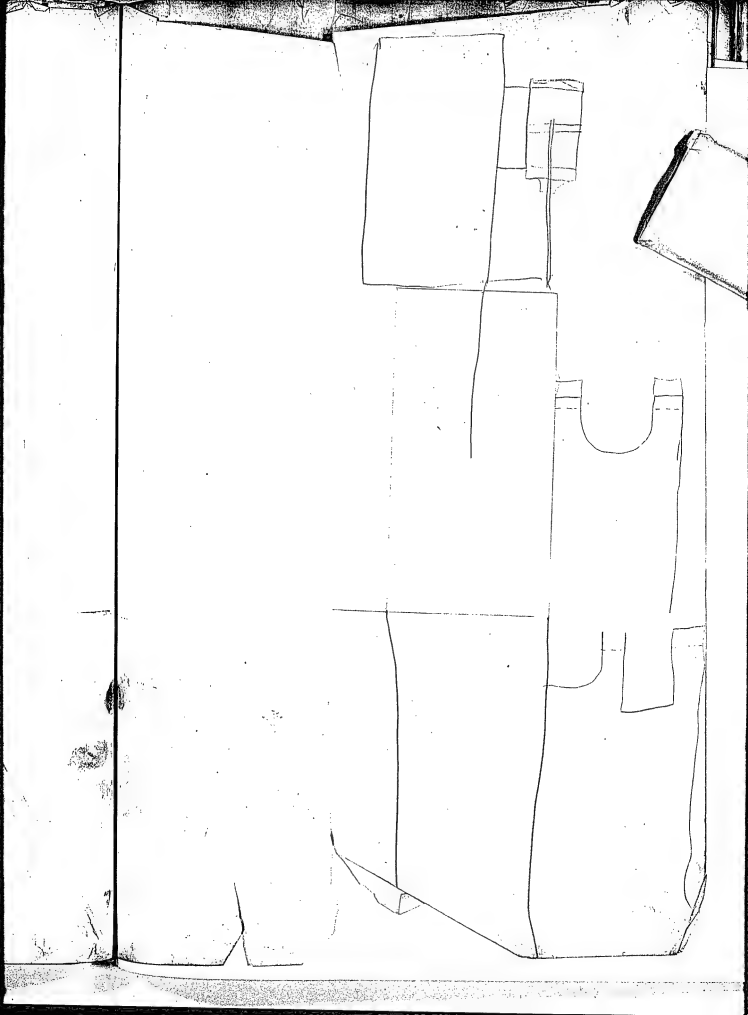
Ogden - John Ott

Jan - 19 - 1895

7 Sounders.
2 Switches K2 each
41 Cop Clocks 12 print
27 Wet paper reels
10 Relays.
48. Bird feeds large







2
24
~~241~~
60
136
146
154
155
164
~~221~~
~~224~~
~~225~~
~~226~~
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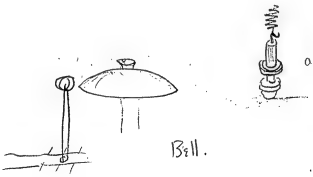
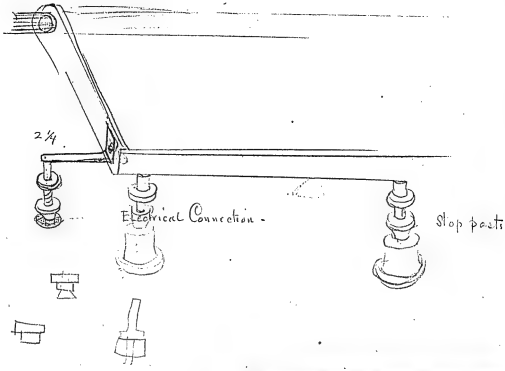
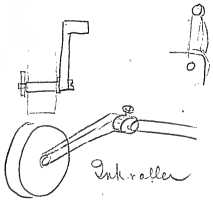

adjusting spring on
Printing lever
Bell.


2 1/4
Electrical Connection -
Stop posts



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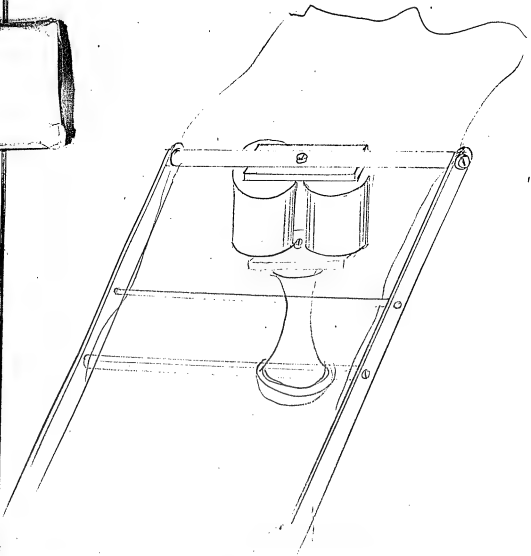

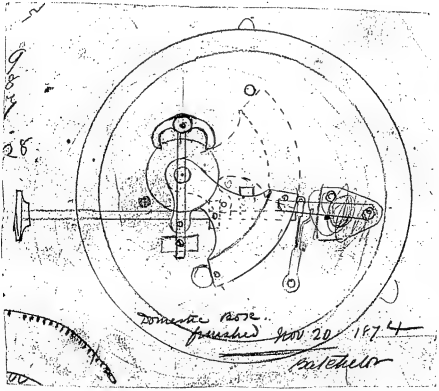

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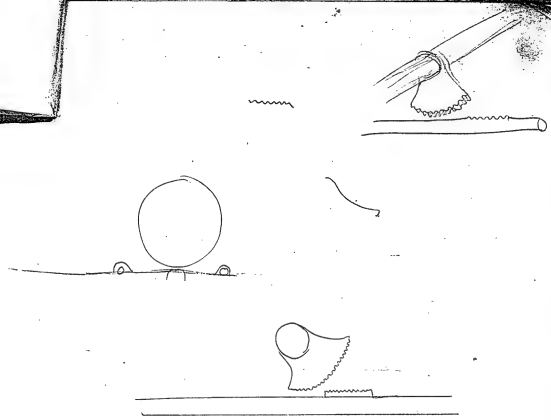

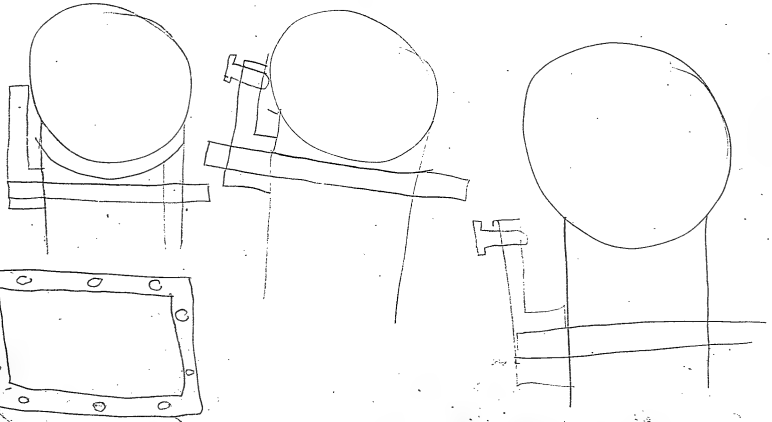

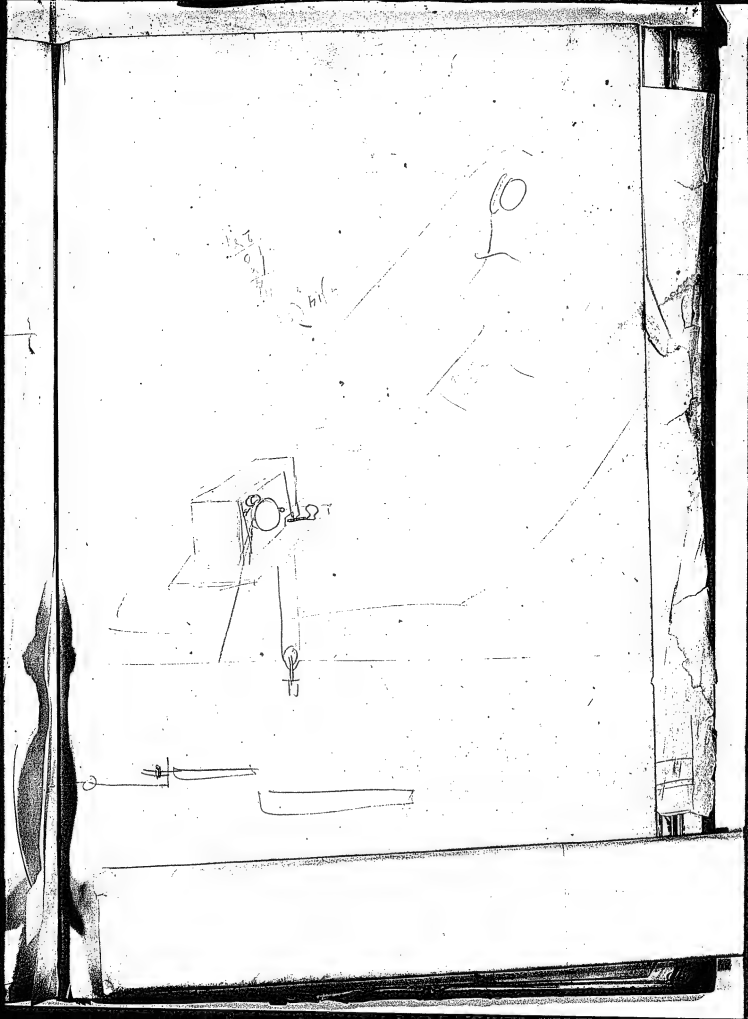

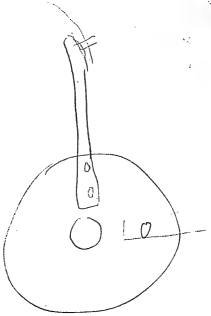

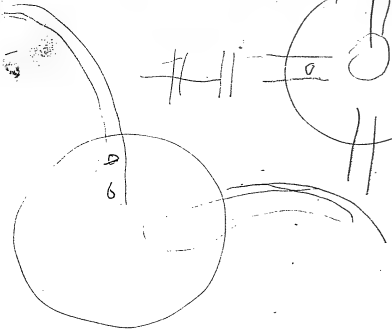

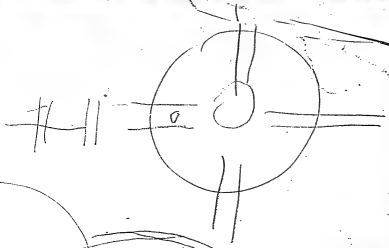

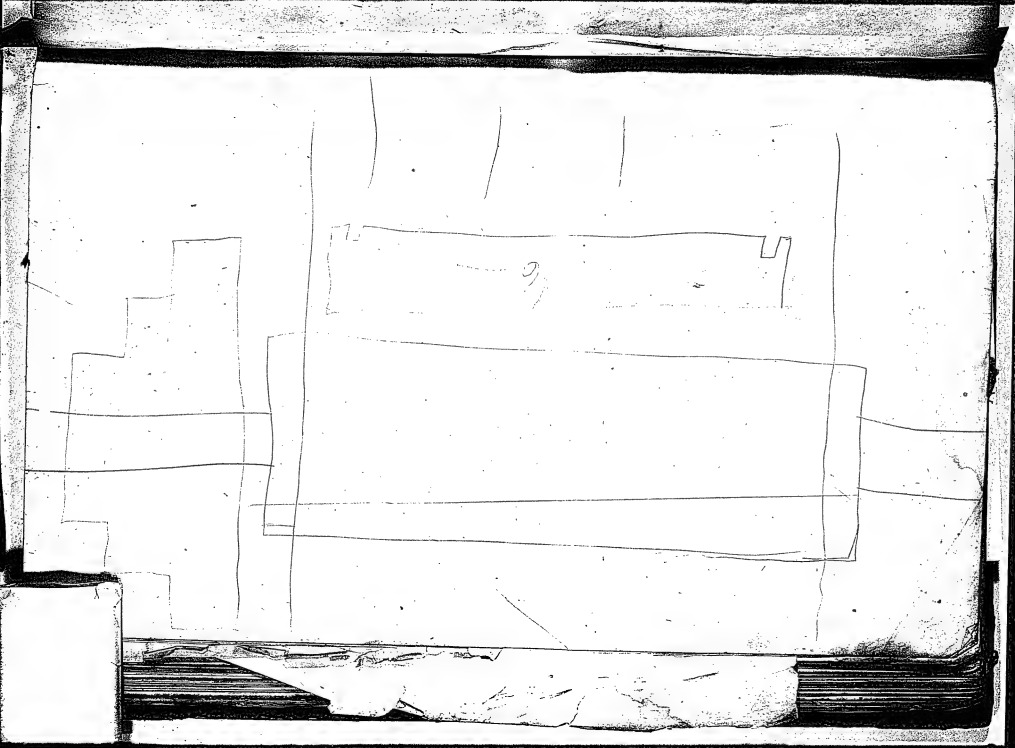

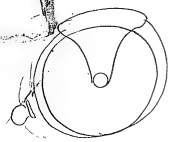

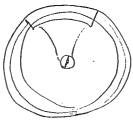

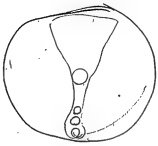

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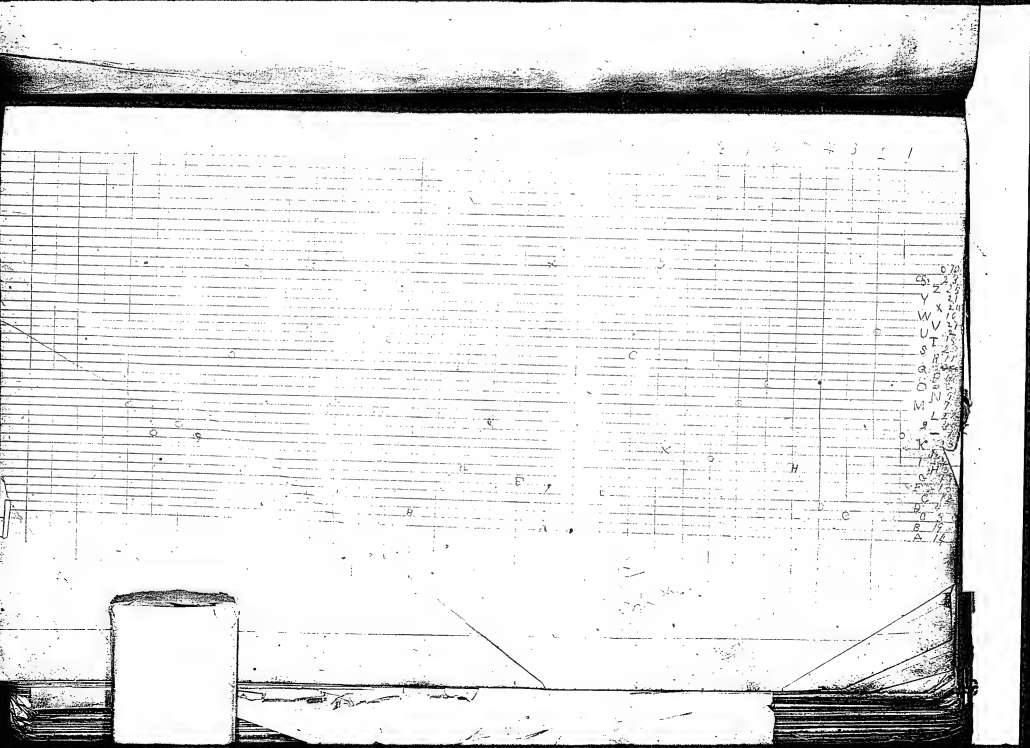

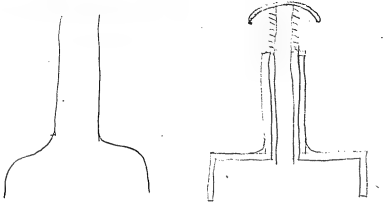

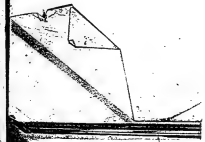

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[illegible]

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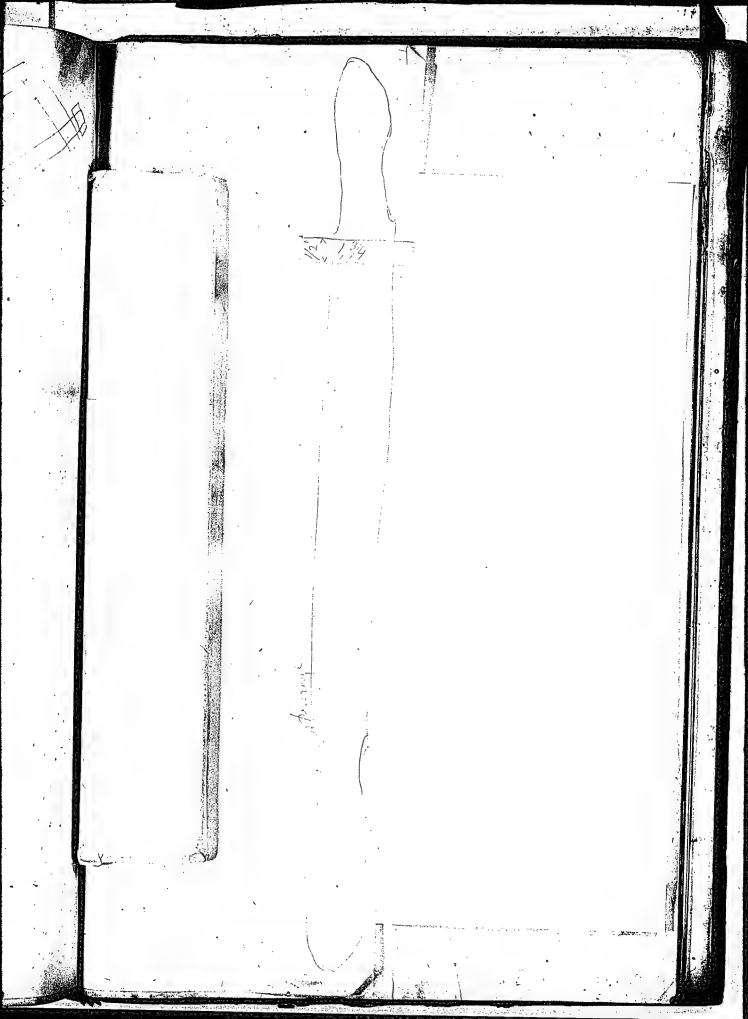

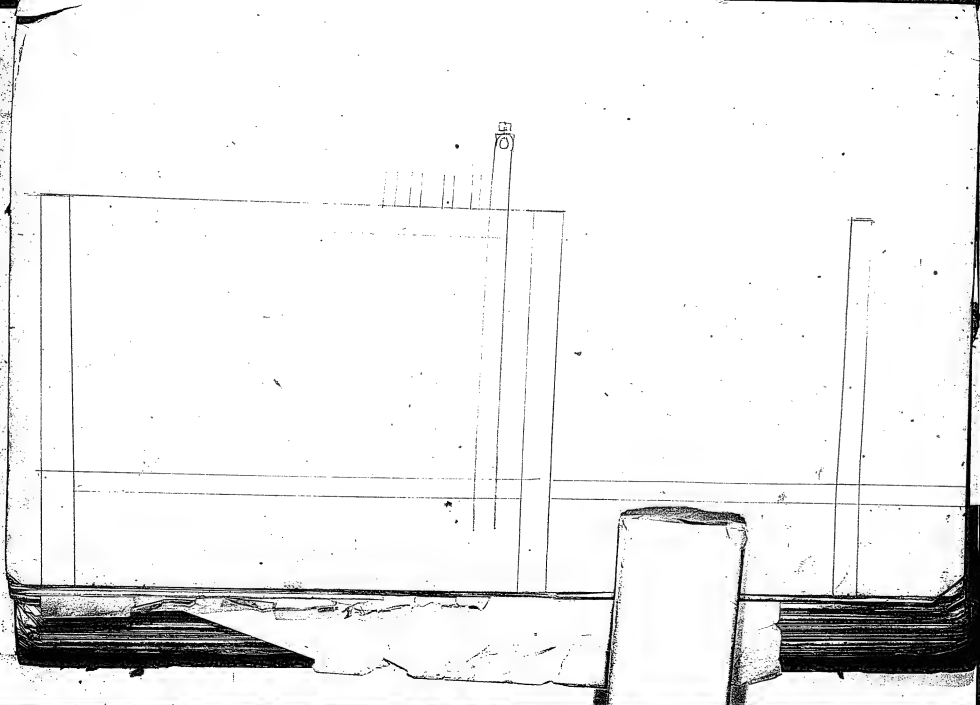

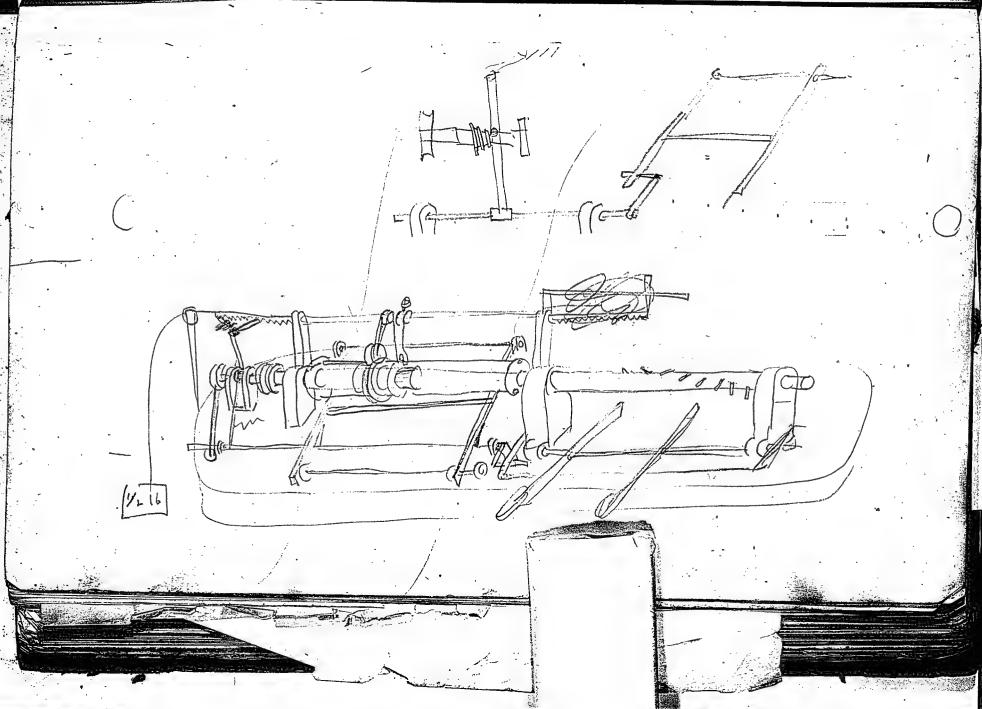
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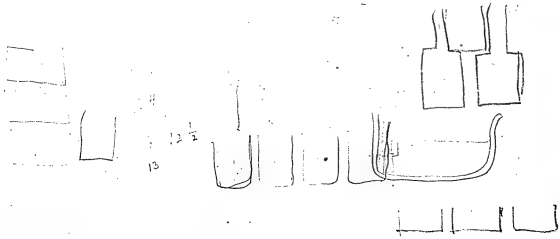
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AUTOMATIC T GRAPH Co

Made by AMERICAN TELEGRAPH WORKS Newark

Thomas West
Hardwick

A
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D = 5 1/2 Lodge of Blade
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F 2 1/2 – –
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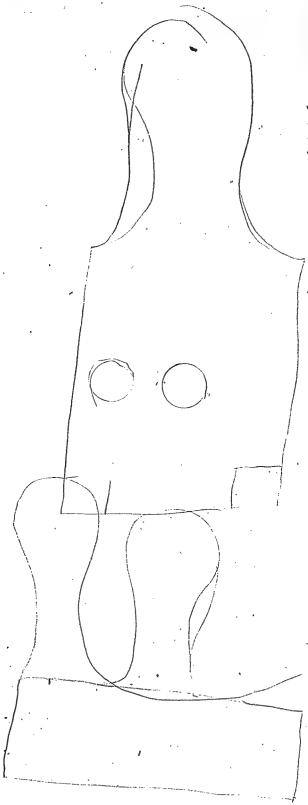
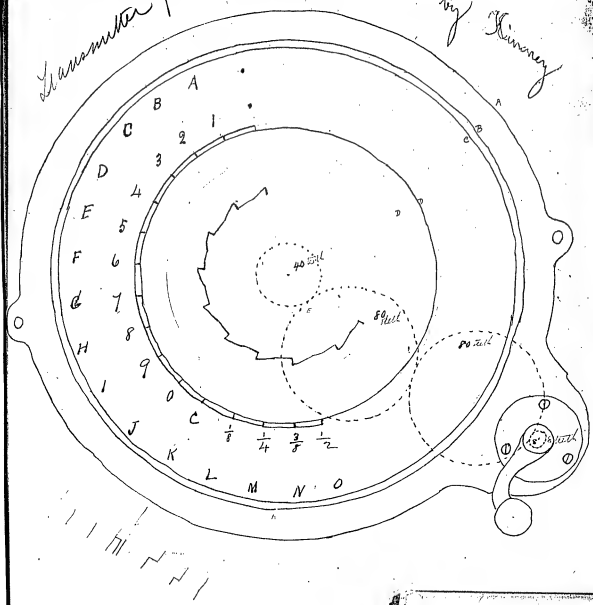
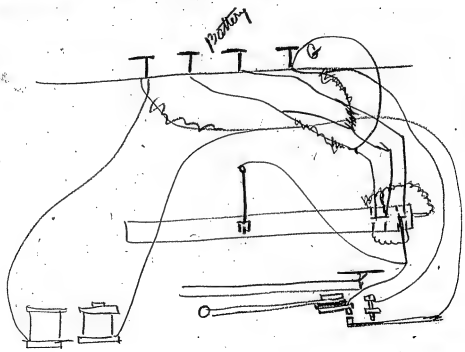


Instrument for Stroke & Winter. Made by Kinnersley

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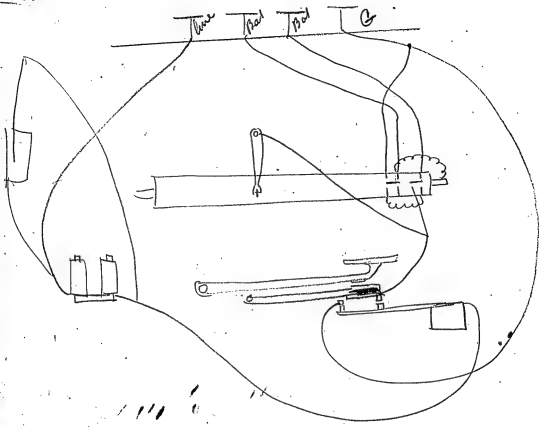
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William Squires 136 [illegible] st Newark

Adrian Riggins 131 [illegible] st "

[illegible] C. [illegible]

Horace [illegible] 322 [illegible] st Newark

[illegible]

Harry [illegible]

William Smith [illegible] st [illegible]

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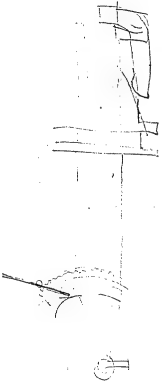
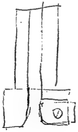
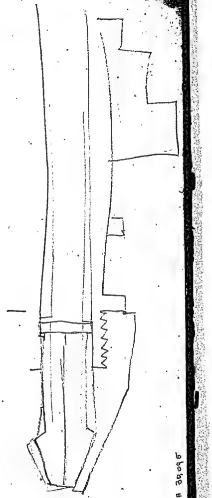






Laboratory Notebook, Cat. 1169

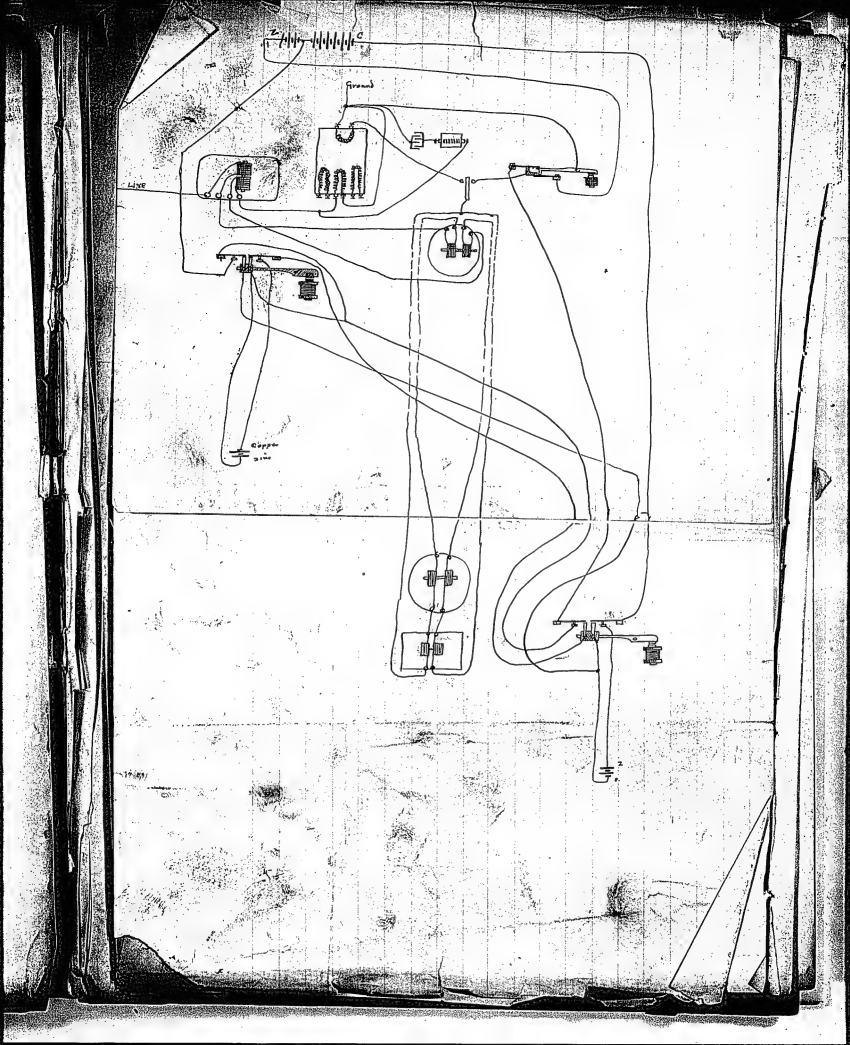
This notebook covers the period March 1875-November 1876. The book was begun by Charles P. Edison, who inscribed the first page: "C.P. Edison Newark New Jersey March 10th 1875." The only other dated entry in the first part of the book is for October 5, 1876. Most of the material relates to telegraph apparatus. Included are circuit diagrams, drawings of instruments (especially printers, sounders, and keys), and calculations. There are also cartoons and doodles.

The second part of the book contains signed drawings by Thomas A. Edison, along with a few by James Adams. The drawings relate to multiple and acoustic telegraphy, and the few dated ones fall between September and November 1876. In addition to the drawings, there are clippings and advertisements about electrical apparatus and steam engines, and an obituary of Marshall Lefferts.

The book contains 157 numbered pages, preceded by seven unnumbered leaves. The number 151 has not been used. Many leaves were apparently torn out before the pages were numbered.

C. P. Edison
Newark.
New Jersey.

March. 10th 1875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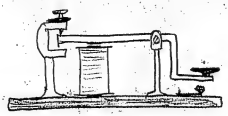
HgFeaCgg
A



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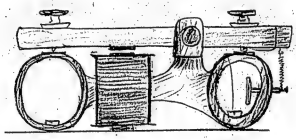

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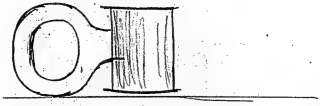

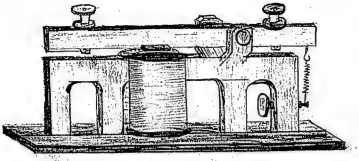

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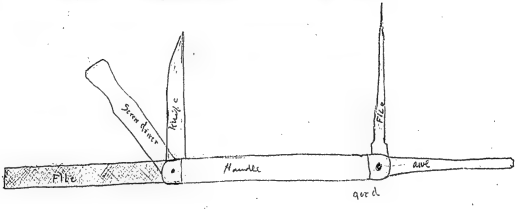

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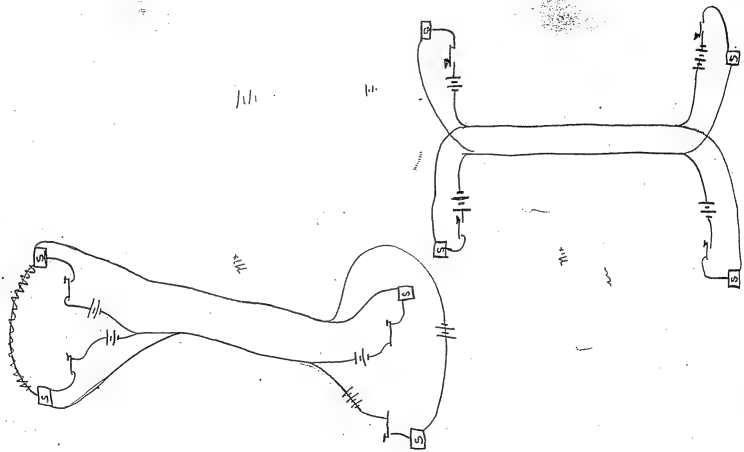

Street Singer

Mix

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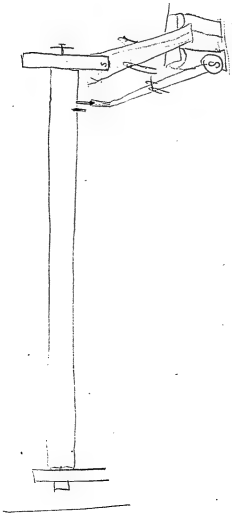

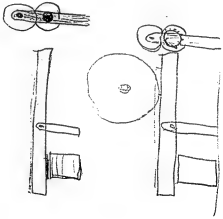

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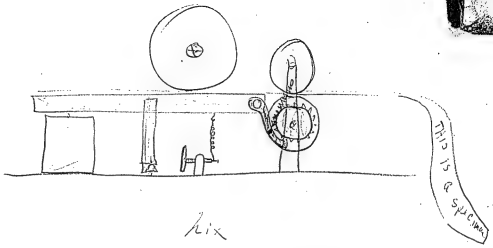
W.P.E. Dison



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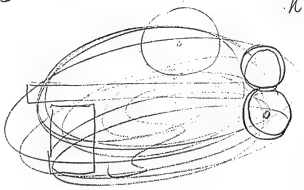
CPedison

Kix March 21th

CPedison



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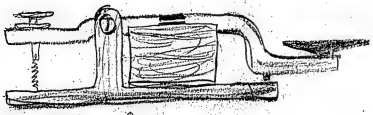

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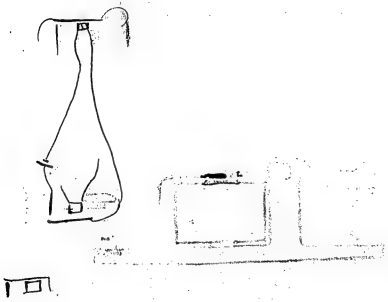
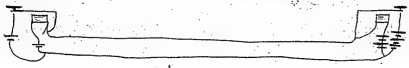
Res. C good

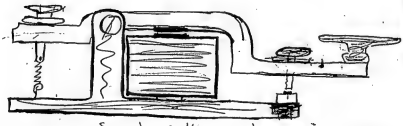




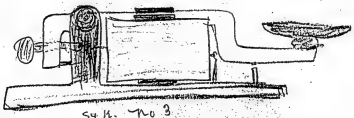
To much Nix

Nix

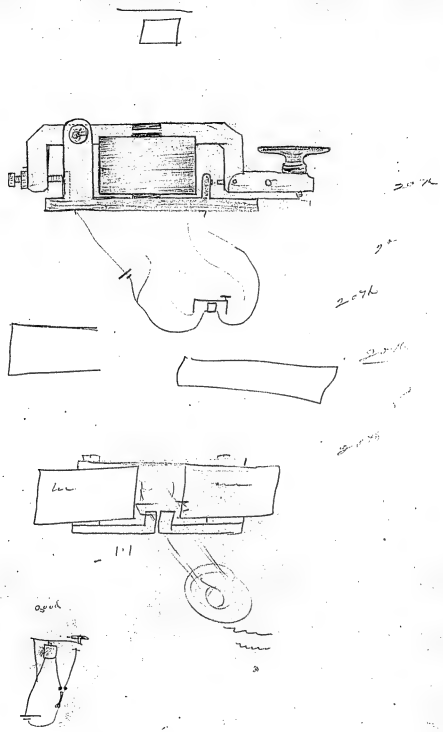
When there are a circuit in the magnet it closes the contact Points, on the Key, and cuts out the Magnet so it is nix



Sounder & Key No 1
good



Sy K. No 3.
good.or Red Not Bully



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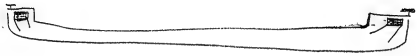

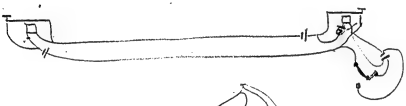

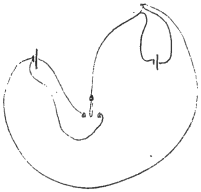

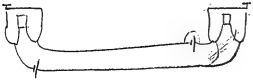

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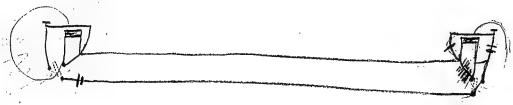
5-45 ans



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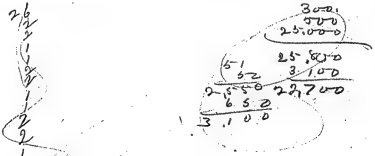
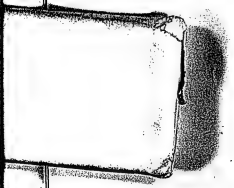
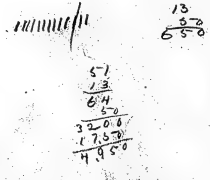
~~Red Wolf Bolting~~ April 10th 1875

Plan







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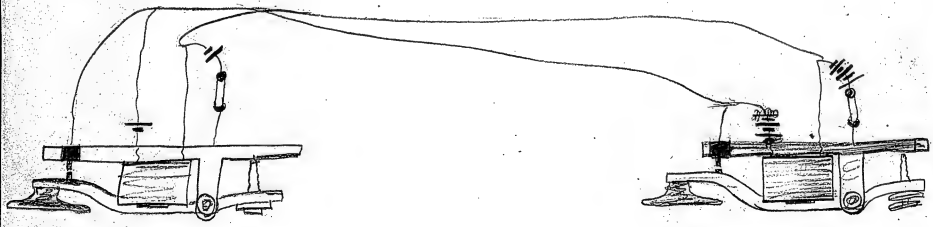

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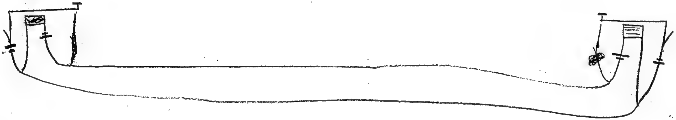
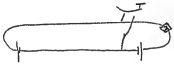
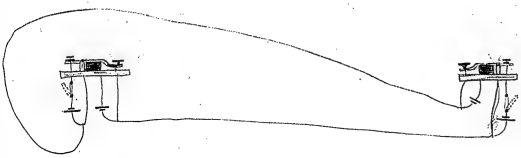
Boss. Reed, Hodi, Bully
mix



connections for. Clefson





Connections for. Clefson.

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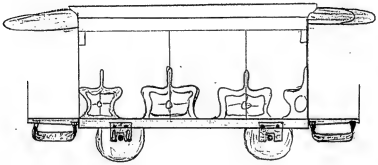

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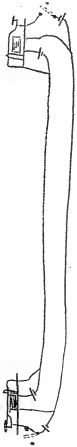

Fig. 7

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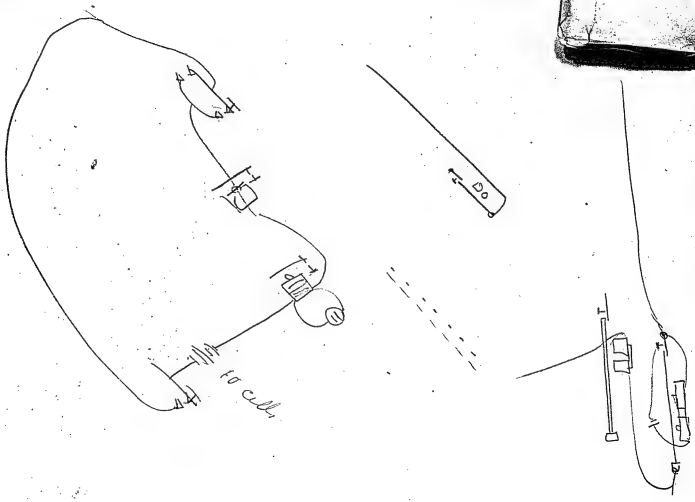

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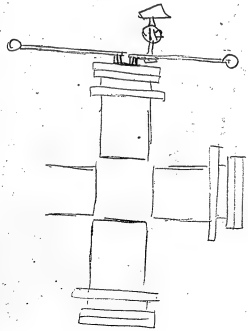

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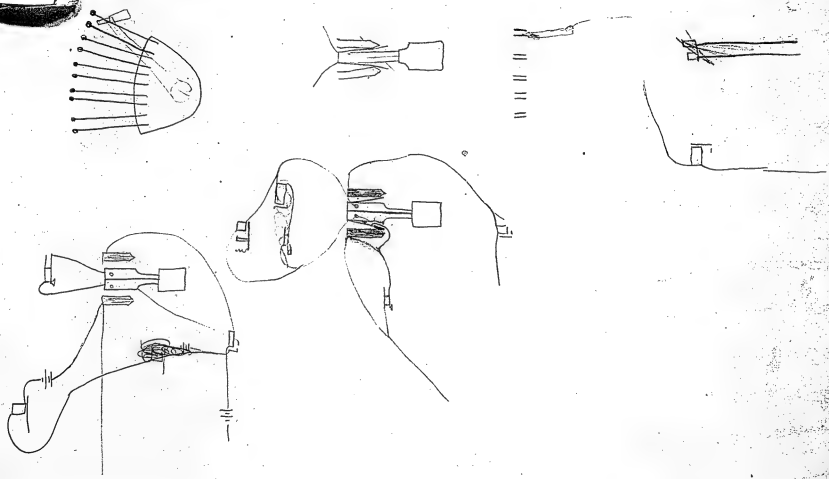

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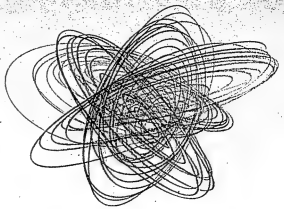

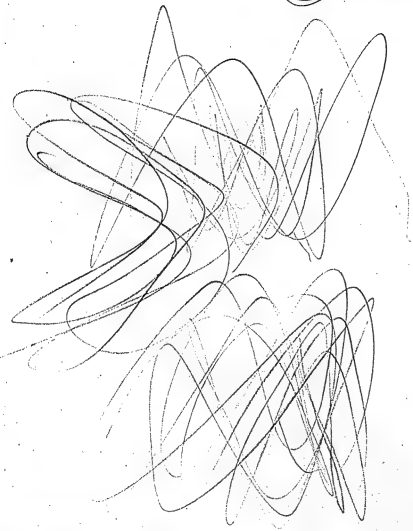

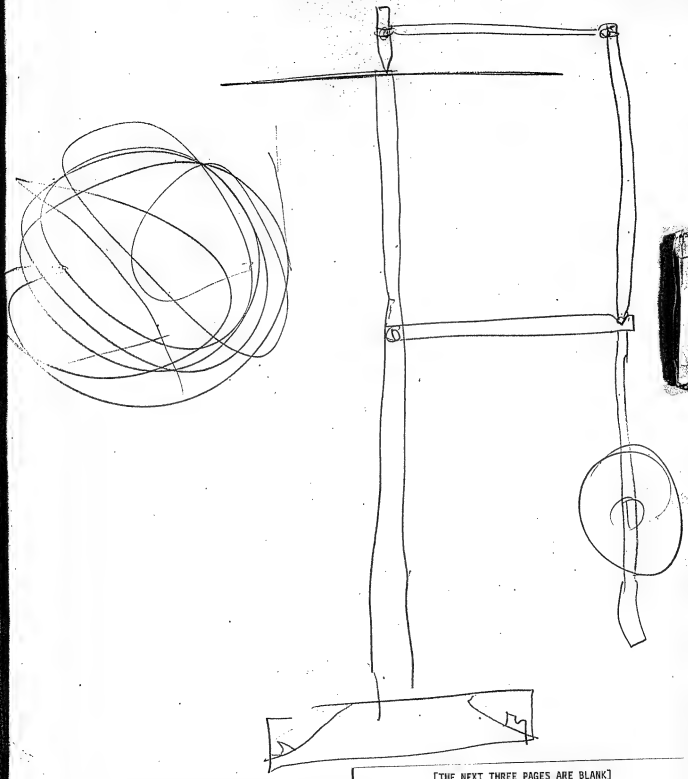

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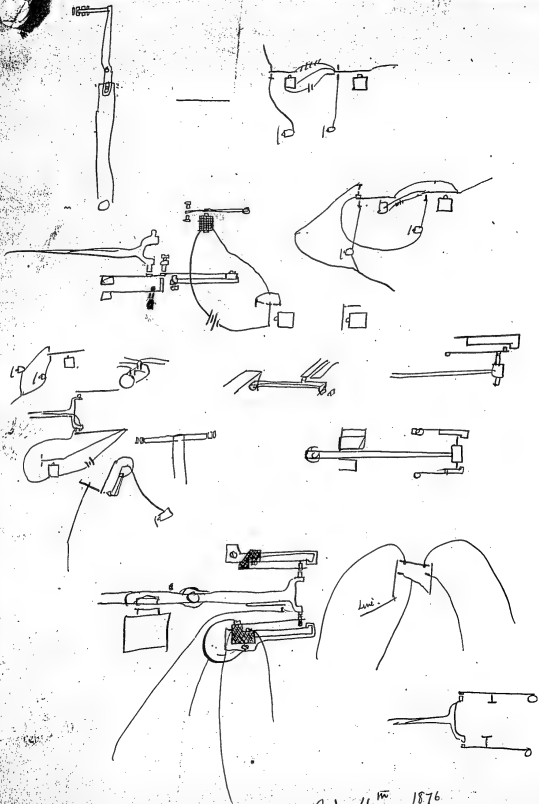

Oct 4th 1876

James Adams

The Emperor of Russia

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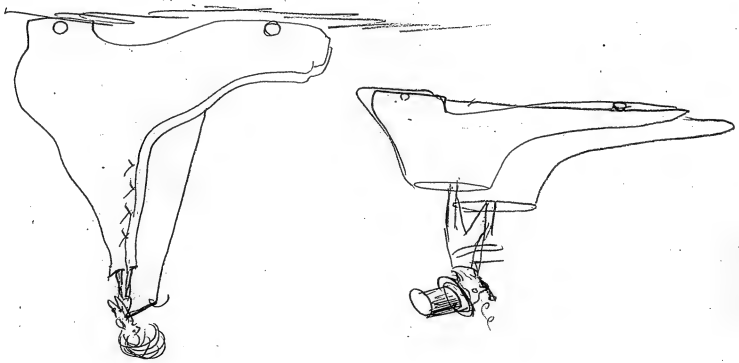

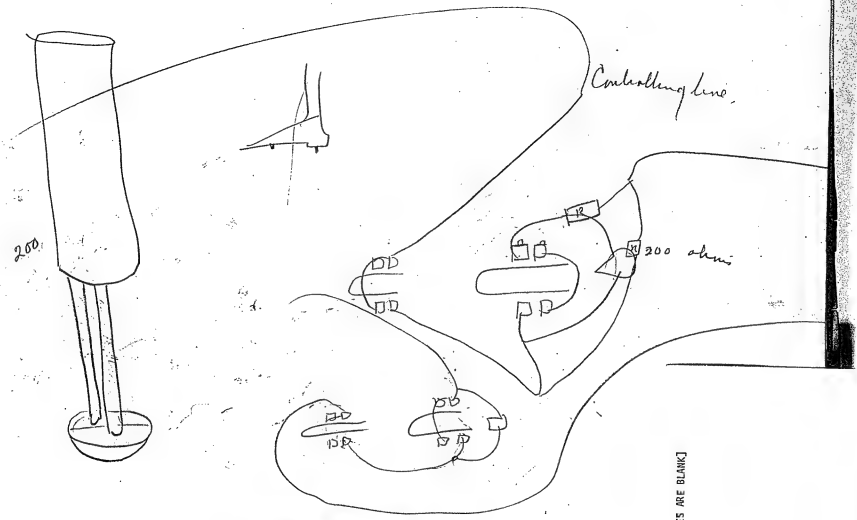

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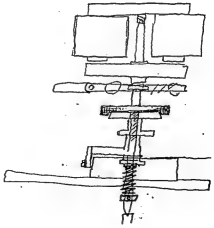

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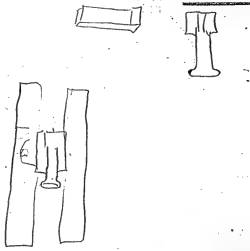

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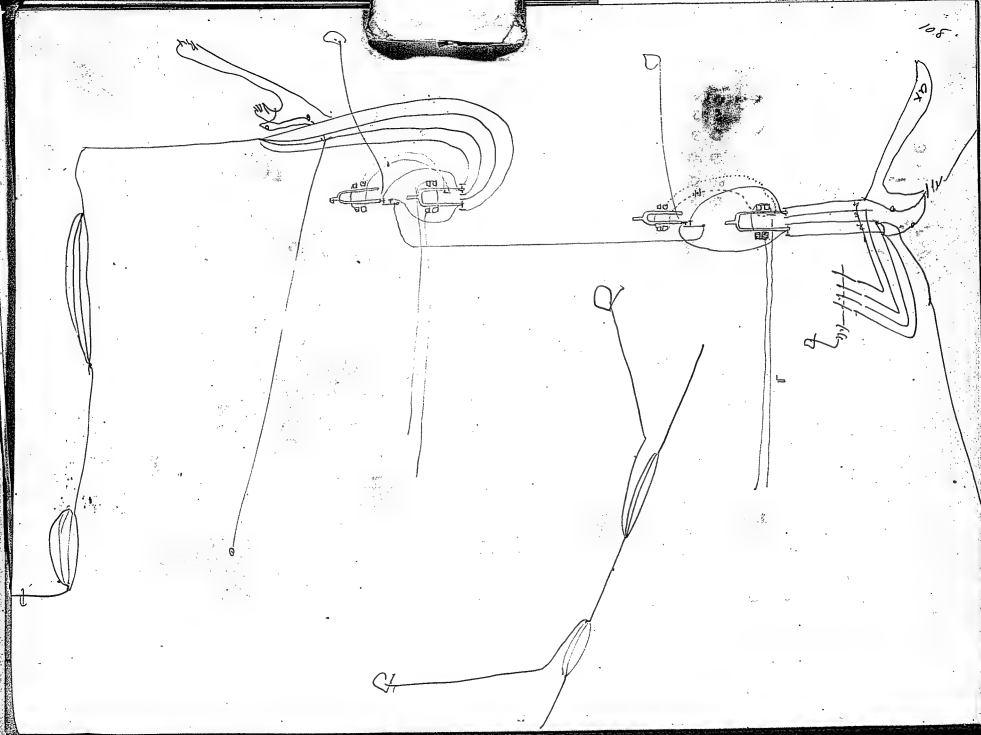

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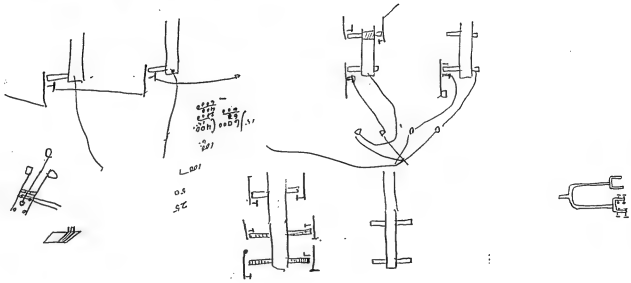

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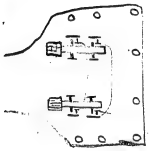

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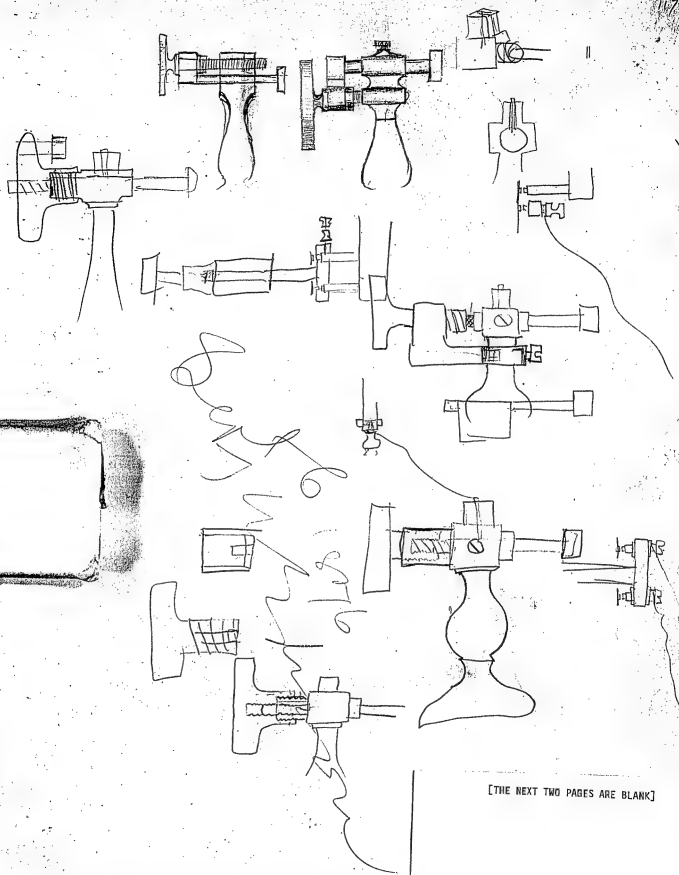
Sept 6
1896



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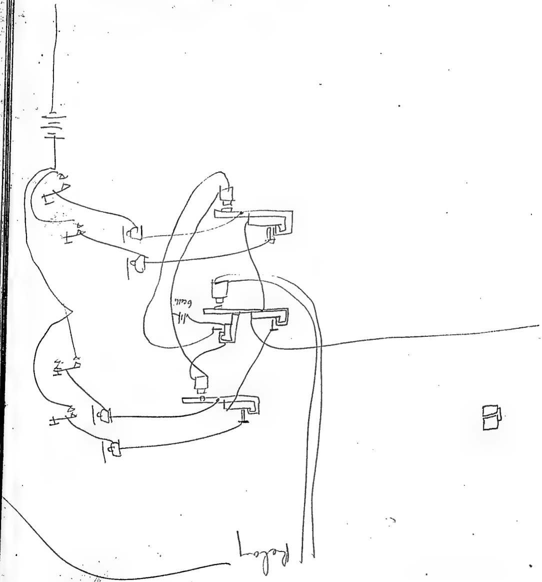

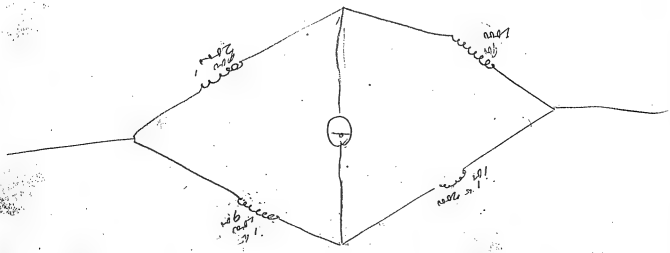

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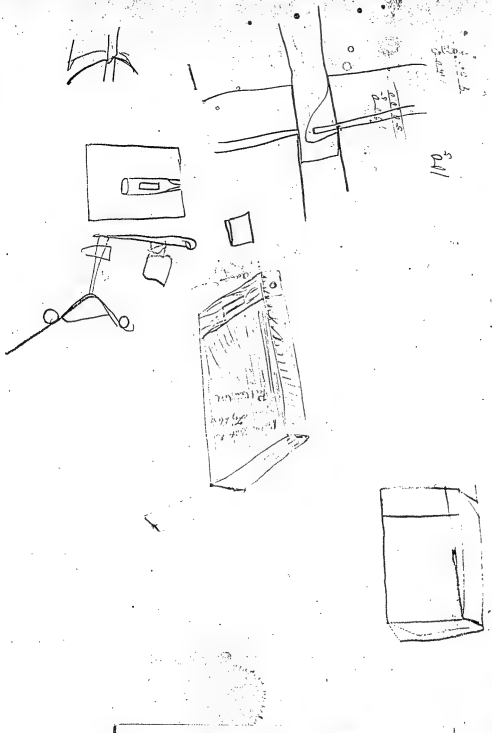

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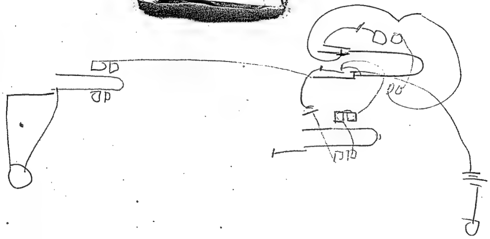

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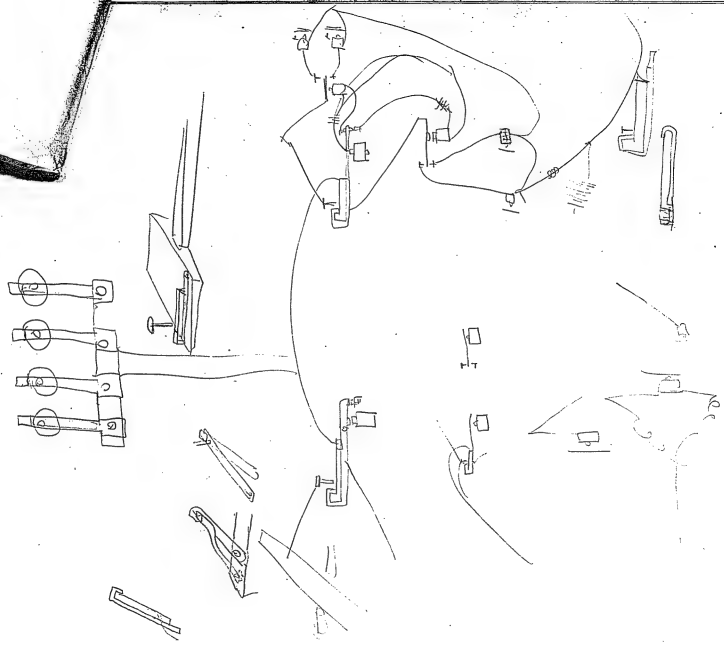

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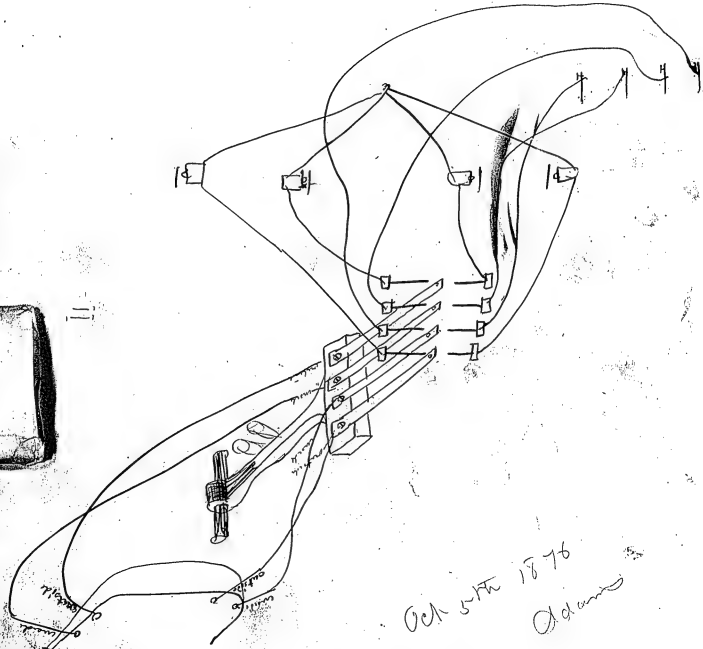

Oct 5th 1976

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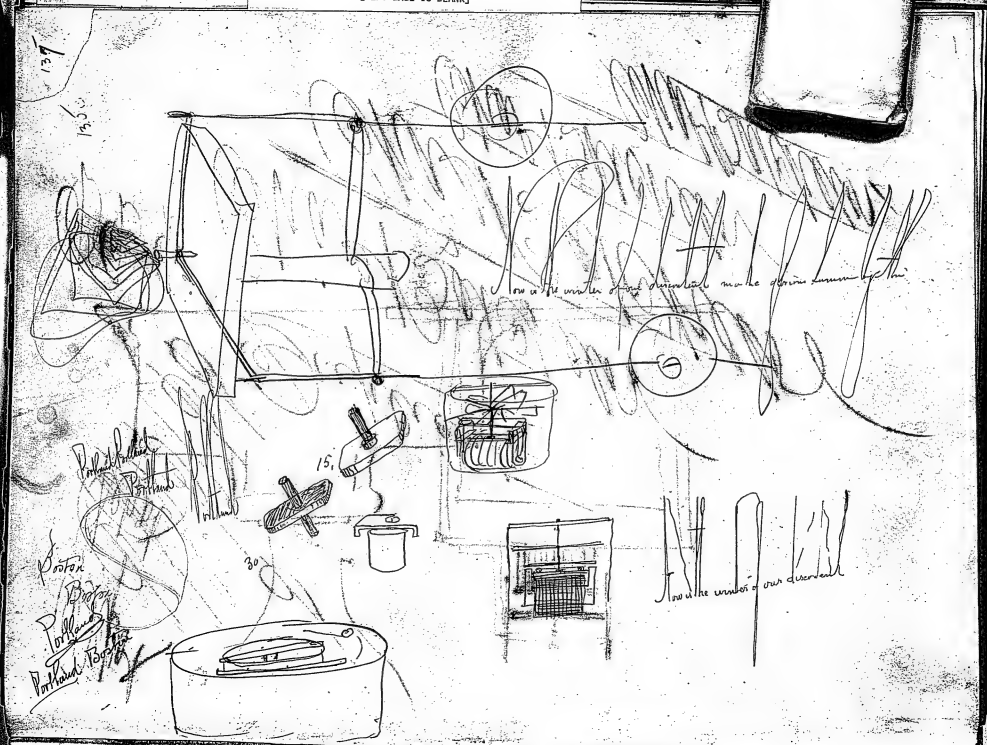

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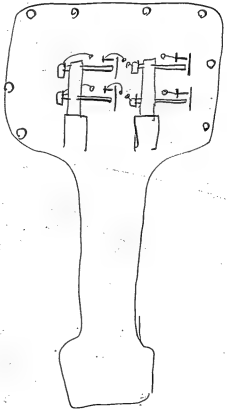

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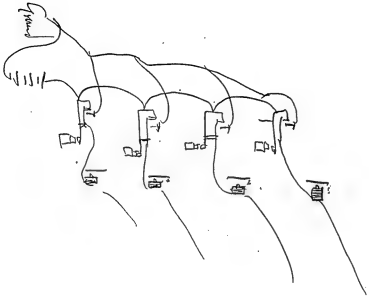

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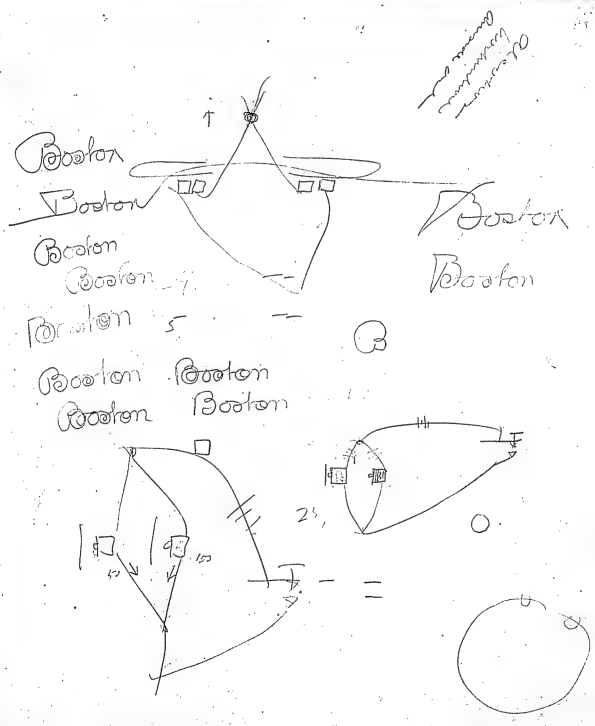
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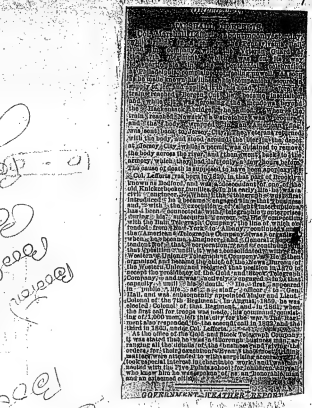


OBITUARY.

COL. MARSHALL LEFFERTS.

Col. Marshall Lefferts died about noon yesterday while riding in a car on the Pennsylvania Railroad in company with the Veteran Guard of the 7th Regiment, which was on its way to participate in the Centennial celebration at Philadelphia, complaining of feeling unwell. As soon as he made known his illness, his companions secured a supply of ice and applied it to his head, but before the train reached Bergen Cut he became insensible, and while it was crossing the meadows beyond the Hackensack bridge, he died. When the train reached Newark, a stretcher was procured, and the body, wrapped in an American flag, was sent back to Jersey City. The Veterans returned with the body, and stood around the bier in the depot at Jersey City while a permit was obtained to remove the body across the river, and then went back to the armory, which they had left only a few hours before. The cause of death is supposed to have been apoplexy.

Col. Lefferts was born in 1820, in that part of Brooklyn known as Bedford, and was a descendant of one of the old Knickerbocker families. In his early life he was a civil engineer. When the telegraph was first introduced he became engaged in that business and, with the exception of slight interruptions, has been connected with telegraphic enterprises during his subsequent career. His connection with the Bain Telegraph Company, the line of which extended from New-York to Albany, continued until the American Telegraph Company was organized, when he became Engineer and General Superintendent of that corporation, and continued in that position until it was consolidated with the Western Union Telegraph Company. He then organized and became the chief of the News Bureau of the Western Union, and resigned that position in 1870 to accept the presidency of the Gold and Stock Telegraph Company, and he was actively engaged in that capacity until his death. He first appeared in public life as a staff officer to Gen. Hall, and was subsequently appointed Major and Lieut. Colonel of the 7th Regiment. In August, 1859, he was elected Colonel of that Regiment, and in 1861, when the first call for troops was made, his command, consisting of 1,000 men, left this city for the war. The Regiment also responded to the second call in 1862, and the third in 1863, under Col. Lefferts.

At the office of the Gold and Stock Telegraph Company it was stated that he was a thorough business man, arranging all the details of the business and giving the orders for their execution. Even the most trifling matters were attended to with a surprising accuracy. He took special interest in charitable work, and was connected with the Five Points school for children. By all who knew him he was spoken of as an honorable man and an esteemed citizen.

GOVERNMENT WEATHER REPORT.

Boston

Boston

Boston

Boston

Boston

Boston

Boston Boston

James Adams

Jas Adams

James Adams

James Adams

Jas Adams

Jas

Batchelor

Tinware Polishe

Examine to be used

Stove holder that could not be used up with a brush

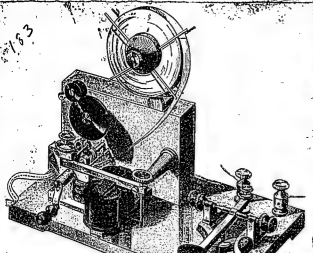
Board ditto

Argan Lighter

More Policy Battery

good in theory plan of carrying [illegible]

[illegible]



[Patent applied for.]

W. U. Pattern Relay.

This Relay is acknowledged to be the best in use. Is finely finished.

Price, $16.

THE FAVORITE.

Price, $3.00.

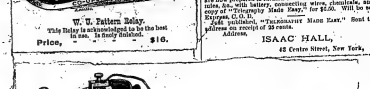
Having reduced the price of these standard instruments, we are now prepared to furnish them to amateurs, students, scientists, &c., with Leather Carrying Cases, Manifolds, and one copy of "Telegraphy Made Easy," for $3.50. Will be sent by express, C. O. D.

Add postage, "TELEGRAPHY MADE EASY," Sent to any address on receipt of 25 cents.

Address,

ISAAC HALL,

42 Centre Street, New York.



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THE PENNSYLVANIA TELEGRAPHIC AGENCY,

WAVERLY HEIGHTS, PENNSYLVANIA.

PERFECTLY SILENT.

Nickel Plated.

FULL SIZE RAILROAD SOUNDER AND KEY.

NORTHS MAKE OF GAS ON NICKED IRON. Is finely finished, mounted on Walnut base.

1 cell Callaud Battery, office wire, chemicals, copy Smith's Manual, sent C. O. D. $12 50

If money be sent in advance by registered letter 12 00

Instruments without Battery 11 00

Telegraphic and Electrical goods of every description at manufacturers' lowest prices.

Send for Circular.

THE BALTIMORE BATTERY.

[illegible] to be superior to any other for Telegraph [illegible] Battery.

[illegible] comparative test made the past year resulted in the [illegible] of our Battery.

A prominent Superintendent writes: "My impression is the Battery is to be the Battery of the future." He has others in [illegible] to determine the value of each in service.

[illegible] in use on commercial and railroad lines, stock reports, [illegible] telephone, private lines. Superintendents fire alarm telegraph [illegible] it as the most reliable they have used.

[illegible] furnished Gold and Stock Telegraph Co. of New York, who use no other.

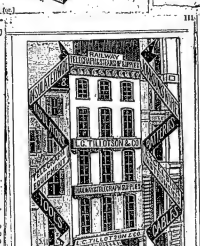
[illegible] closed circuit it is without a rival.

[illegible] kinds of Battery and Battery material fr[illegible]

WATTS & CO.,

47 HOLLIDAY ST., BALTIMORE.

OUR ILLUSTRATED CATALOGUE NOW READY.



THE NONPAREIL TELEGRAPH APPARATUS,

NEW AND IMPROVED, WITH STRAIGHT LEVER KEY.

FOR AMATEURS, STUDENTS AND SHORT LINES.

This popular *Pioneer Cheap Telegraph Instrument* has recently been improved and a *Straight Lever Key* placed upon it, which makes it as nearly perfect as possible.

Since the introduction over 3,000 of them have been sold, and is still the *leading telegraphic apparatus of its class.*

They are furnished at the following popular prices:

Single Instruments, with three cells of Battery, Chemicals, Connecting Wire and Instruction Book,	15.50
Two sets of Instruments, etc.,	13.00

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P. O. Box 6503.] 38 Vesey street, N. Y.

THE AMATEUR'S TELEGRAPH APPARATUS.

(Patented April 16th, 1878.)

ONE CUP BATTERY, CHEMICALS, WIRE AND MANUAL WITH EACH INSTRUMENT.

Complete outfit for the Student or for short line use.

Price, $7.50.

Key and Sounder only	$ 5 25
" " with Lightning Arrester	8 00

Five per cent. discount for cash in advance.

GEO. H. BLISS & CO.,

41 THIRD AVENUE,

Chicago, Ill.

CHAMPION HORGAN-NEWS AND ANNUNCIATOR COMPANY,

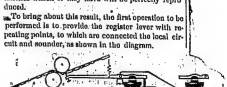
40 WEST 13th STREET, NEW YORK.

A NOVEL DEVICE.

[From The Operator.]

We hope by aid of the annexed diagram to clearly describe a method by which a person in the possession of any ordinary Morse Register may have the pleasure of listening to his own writing, of copying it from a sounder, with the assurance that any peculiarities which it may have will be perfectly reproduced.

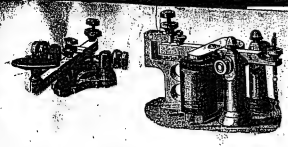
To bring about this result, the first operation to be performed is to provide the register lever with repeating points, to which are connected the local circuit and sounder, as shown in the diagram.



If the embossing point be so adjusted that it will give a deep, smooth indentation, and a number of sentences are embossed upon the paper in the ordinary manner, they may be repeated by disconnecting the embossed strip and inserting the first part of the rolls in such a position that the indentations are in line with the embossing point.

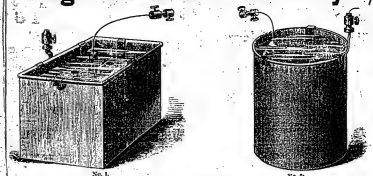
ought to [illegible] lowing is [illegible] within it

Subp[illegible] Recei[illegible] Para[illegible]



Eagle's Metallic Battery.

154



No. 1. No. 2.

The "Snapper" Sounder

PRICE 30 CENTS.

$2.00 per doz.
$1.50 1-2 do.

Patented March 9, 1875.

Polished 30 cts. or 6 for $1.50, $2.10 per doz.
Polished Nickel-Plated Base, 40c., *or 6 for* $2.
Polished, with Knob and Screw Fastenings, 75 cents.

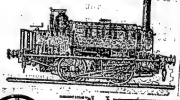
PRICE

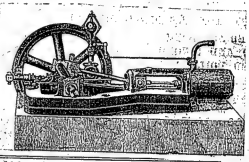
75 CENTS.

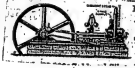
Sent post-paid on receipt of price.

R. W. POPE, Box 5278, N. Y.

TANK LOCOMOTIVE ENGINES.







(PATENTED SEPT. 26, 1871.)

THE FAIRY ELECTRIC ENGINE.

A perfect working model of an engine **Run by Electricity!**

It will work well with an ordinary local battery.

Price, with two cells Engine' Metallic Battery..... $6.00
without Battery..... 4 00

FOR SALE BY:

THE ELECTRO-MAGNETIC M'F'G CO.,
33 Broad St.,
BOSTON, Mass. NEW YORK

Self-Instructing Telegraph Instrument.

PATENTED MAY 8TH, 1866.

Best instrument for learners, and the only one of its kind. Over 15,000 sold in 12 months. This instrument works without a battery, yet works as well as any Double Magnet Main Line Instrument. No expense whatever to keep it in order, is adjustable and portable, finished in the best style. Manufacturer makes the best manufacturers. A copy of Turrr's Manual on Telegraphy and one of these instruments sent on receipt of price, $15. Size full shipping dimensions, cases of Ebony and Black.

Address D. W. PUTT & CO.

WILLIAM E. DAVIS

Manufacturer and Dealer in

TELEGRAPH INSTRUMENTS

341 Newark Avenue, Jersey City, N. J.

Now offer for sale, or will manufacture to order:

REGISTERS, RELAYS, LOCAL SOUNDERS, MAIN SOUNDERS, SWITCHES.

INVENTORS' MODELS, &c.

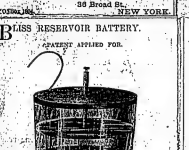
NEW STYLE SOUNDER—"UNCLE SAM."

Price $6.00.

NEW GALVANIC BATTERY.

BLISS RESERVOIR BATTERY.

(PATENT APPLIED FOR.



Price per Cell, ... $2.00.

This Battery gives a stronger current than the same size Bill or Callard Cups. It will run as a local battery for six months without attention, and as a main battery for a longer period.

GEO. H. BLISS & CO.,
41 THIRD AVENUE,
Chicago, Ill.

A NEW GALVANIC BATTERY.

Durability, Efficiency, and Economy of Expense and Labor at Last Secured.

THE EAGLES METALLIC BATTERY.

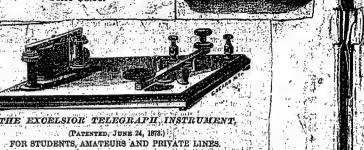
PATENT APPLIED FOR.

The undersigned having secured the exclusive Agency for the manufacture and sale of the

EAGLES METALLIC BATTERY,

now offer them to the public as the best Battery for Telegraphic and other purposes yet devised.

The Battery cell is made of [illegible]



THE EXCELSIOR TELEGRAPH INSTRUMENT,

(PATENTED, JUNE 24, 1873)

FOR STUDENTS, AMATEURS AND PRIVATE LINES.

This Instrument, since its introduction by us, has become as familiar as "household words" throughout the country, and has met with universal favor everywhere. Some private lines are now using two or three dozen of them on circuits of from three to ten miles. They have finished sounder and key, neatly finished in our superior bronze metal, all mounted on a fine finished mahogany base. They are sold at the low price of $5 50 for the key and sounder, or $7 50 for key and sounder and office outfit.

No. 1 Key.

This Key is of a beautiful design, and durable in construction, and is perfect in all its details which constitute an excellent working Morse Key. No. 1 Key Curved or Straight Lever.

Price, ... $4 75.

Operator's Learner's Instrument.

A complete outfit, embodiment a fabulous combined Sounder and Key mounted on a mahogany base, with finished cover, and full instructions, instructions, or in other words constitute an "aid" for practicing or communicating purposes, being in all respects a regular Morse Instrument, composed of a first-class Sounder and our improved curved lever Key, made in the best manner, and finished in the best style, and which will work in any way combine in the Operator's Learner's Sounder and Key combined. The instructions are clear and practical, and contain all information necessary for the student. All included terms and expressions are avoided, as they are of popular and misleading meanings more difficult.

Learner's Instrument Complete, $9.50;
Operator's Learner's Sounder, $6.00;
Operator's Learner's Key with Battery, $4.00.

LITTLE MONITOR!

PRICE, $6.00.

Only One Cell of Local Necessary.

This is a nicely-finished Table Instrument, having SOLID-BRASS Instrument Stand, Sounder and Lever, and mounted on finished Mahogany Base.

A LITTLE MONITOR KEY TO MATCH.

It will use the ordinary cell, with EXTRA LARGE PLATE, and will do the work of a Sounder, Relay and Local Sounder.

Both of the above Instruments sent on receipt of $6.00.

The Little Monitor Relay,

A beautiful, nicely finished Table Relay, with Adjustments, and mounted with polished Rosewood, Price, $3.00.

SOUNDER SUPPORT, Price, $0.50.

SOUNDER AND RELAY SUPPORT, Price, $1.00.

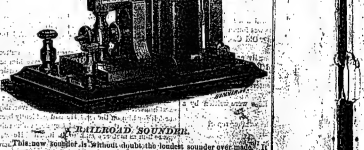
LEARNER'S SET, consisting of Sounder, Relay, Instruments, Support, Cell, Wire, Screws, Screw Driver, Instructions, DANIELL LOCAL BATTERY, with Glass Jar, Copper Cell, Zinc Rod, Porous Cup, Sulphate of Copper, Sulphuric Acid, Price, $15.00.

DELUXE LOCAL, with improved connecting cup cell, $18.00.

DELUXE LOCAL, with Bill Cup Cell, $18.00.

Send stamp for Illustrated Catalogue, Special prices by mail.

M. A. BUELL,
36 & 37 Waring Block, Cleveland, Ohio.



A RAILROAD SOUNDER.

This new sounder is without doubt the loudest sounder ever made, is designed especially for railroad offices where the ordinary sounder cannot be distinctly heard. Nothing can be found to equal it. Price, $7.00.

GEO. H. BLISS & CO.,

41 THIRD AVENUE,
Chicago, Ill.

PRIVATE LINE INSTRUMENT.

Price, ... $8.00.

This Instrument is well finished, and gives a clear, loud sound at a moderate weight on a line from a few feet to ten miles in length, in ordinary wire resistance of limited number of other instruments in circuit.

GEO. H. BLISS & CO.,
Chicago, Ill.

ECONOMIZE!

Preserve the life and element. Telegraph Batteries, Electric Instruments and Apparatus of all kinds.

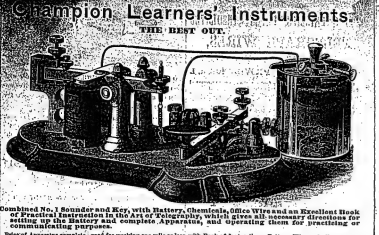
LANNERT & DECKER,
104 Prospect St., Cleveland, O.

Send for circular.

PARTRICK, BUNNELL & CO'S

Champion Learners' Instruments.

THE BEST OUT.



Combined No. 1 Sounder and Key, with Battery, Chemicals, Office Wire and an Excellent Book of Practical Instruction in the Art of Telegraphy, which gives all necessary directions for setting up the Battery and complete Apparatus, and operating them for practicing or communicating purposes.

Price of Apparatus complete, good for working one mile or less, with Book of Instructions, Battery, Wire and all necessary connections, ready for immediate use, $6.50, by Express, $6.00, or $5.00 if Money Order is the amount, cash in advance. The latter rate will admit of your paying the Express charges for returning money, and we hereby agree that whenever these Instruments, when received by the purchaser, are found to be unsatisfactory, we will receive them back, and return the amount sent us, less the Express charges.

Single Instrument, good for one mile or less, without Battery, etc.	$6.50	Battery per Cell, complete	$1 50
Single Instrument, good for one mile, Ornamental, with Rubber Covered Coils, without Battery, etc.	7.50	Extra Zincs, each	40
Single Instrument, good for one to twelve miles, without Battery, etc.	7.50	" Zinc Hangers, each	35
Single Instrument, Ornamental, with Rubber Covered Coils, good for 1 to 18 miles, without Battery, etc.	8.50	" Carpers	25
		" Glass Jars	50
		Office Wire, per foot	1
		Blue Stone, per lb.	15
		Book of Instruction	25

LEARNERS' SOUNDERS AND KEYS ON SEPARATE BASES.

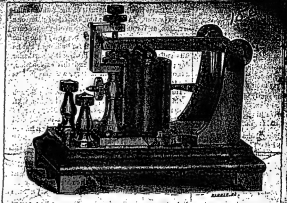
Same style as above is out of Champion Learners' Instruments.

Champion Learners' Sounders.....$3 50 | *Champion Learners' Sounders, with rubber covered coils*..$4 00
Champion Learners' Keys, fine finish.....$3 00.

These Instruments are now extensively sold, and label the reputation everywhere of being far superior in every respect to any form of Learners' Apparatus or Short Line Instrument yet offered.

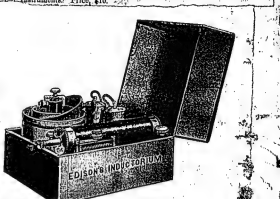
PARTRICK, BUNNELL & CO.,

No. 22 Dey Street, New York. No. 38 South Fourth Street, Philadelphia.



WESTERN UNION SOUNDER.

Some of our customers have a preference for the Western Union style of sounder, and to accommodate such, we keep them always in stock. They are carefully made and elegantly finished, and warranted perfect, as are all our Instruments. Price, $10.



PATENTED JUNE 24, 1873.

SPECIAL NOTICE.

THAT

"THE BEST IS ALWAYS CHEAPEST"

is demonstrated by the unprecedented demand which has arisen for our

Excelsior Telegraph Apparatus

for STUDENTS and AMATEURS.

The system introduced by supplying Agents of Managers and Operators, and sharing the profits from the sales of these Instruments, with them, has also assisted in increasing our sales to such an extent that we have been obliged to enlarge our facilities for their manufacture.

We are now prepared to furnish these invaluable Amateur Instruments, with or without, Office Outfits, in any quantity, and at a moment's notice. Our Agents may now send in their orders as rapidly as their pleases, and can rely upon their being promptly executed.

PRICES AS HERETOFORE.

Instrument Complete, Key and Sounder	$6 50.
Instrument, with Office Outfit	7 50.
Two Instruments and Outfits	14 50.

L. G. TILLOTSON & CO.,

2 DEY STREET, NEW YORK.

Railroad Sounder.

This Sounder is noted for its loud, or at most instructive, tones from that sharp ring peculiar to the Railroad Sounder, and which is so easily heard, so painful to the ear of the operator, and so annoying to others.

We have improved our Sounder by being operated on a Relay, and not as represented in cut. Price, $6 00.

By the Dozen, $6 00.

THE PERFECT BATTERY.

CLEANLINESS. CONSTANCY. ECONOMY.

THE

LOCKWOOD BATTERY,

PATENTED APRIL 8, 1873.

L. G. TILLOTSON & CO., Sole Agents,

No. 2 DEY STREET, N. Y.

LECLANCHE BATTERIES.

IMPORTANT NOTICE.

After JANUARY 1st, 1875, we will allow TWENTY CENTS for each 1pint Porous Cell of this Battery that are returned to us free of charge, in good order. A charge is made in the discount to the trade. A list will be furnished on application to

THE LECLANCHE BATTERY COMPANY,

No. 2 DEY INCORPORATED STREET

L. G. TILLOTSON & CO.,

2 Dey street, New York.

W. HOCHHAUSEN,

Manufacturer of

ELECTRICAL INSTRUMENTS,

193 WILLIAM STREET (rear),

Between Fulton and John Streets, NEW YORK.

One half of actual size

ELECTRIC BELL,

PATENT SELF-CLOSING KEY,

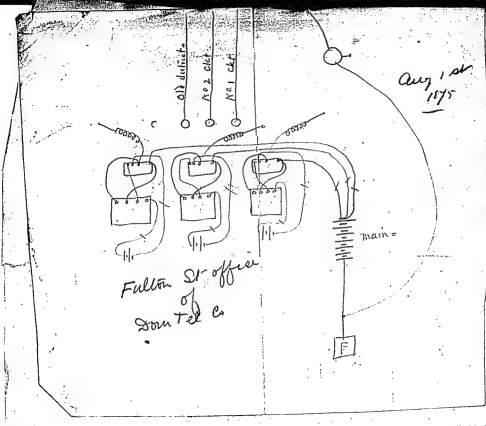
(Patented October 27, 1873.)

Price.....$8 00

Price, $10.

Scrapbook Fragment, Cat. 30,100

This set of 12 unbound and unnumbered scrapbook pages, covering the period August-December 1875, was apparently once part of a larger scrapbook. (Some of the pages in Unbound Notebook, Vol. 9 were probably also removed from the same scrapbook.) The notes and drawings are by Edison and Charles Batchelor and relate to the electric pen, etheric force, and telegraphy. There are also clippings relating to scientific and technological matters, and an unused Domestic Telegraph Co. order form for the installation of instruments. Three loose items, which appear to have been attached at one time to scrapbook pages, have also been filmed.



Form 3.

THE DOMESTIC TELEGRAPH COMPANY,

General Offices, 52 Broadway,

NEW YORK.

NEW YORK, ... 187

TO THE DOMESTIC TELEGRAPH CO.

You will please place ..... of your Signal Instruments in premises No. ..... Street, Room ..... in telegraphic communication with your Company's District Office, entitling ..... to the Messenger, Police Patrol and Fire Alarm service of your Company upon the terms set forth in your circular; and as a rental for each of said Signal Instruments ..... hereby agree to pay to the Domestic Telegraph Company, One Dollar per month, and their usual charge for service when signaled for.

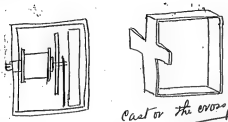
It is hereby mutually understood and agreed that this Company will in no case be liable beyond the sum of One Hundred Dollars for any loss or damage that occurs during, or in course of, the employment of any of its Messengers.

NO CHARGE FOR CONNECTING or REMOVING SIGNAL INSTRUMENTS.

These desiring these instruments, please date, sign and forward this paper to the above offices.

Signed .....

Street, ...



Cast on the cross piece fast on

This is a perfect frame as the frame is perfect in one way to agree to the other.

Oct 1st 1945

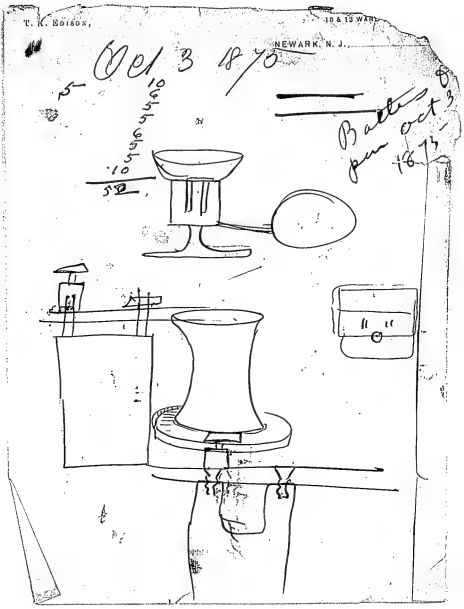
Edisons

Oct 11th 1945

Patented

T. A. EDISON, 10 & 12 WARD, NEWARK, N. J.

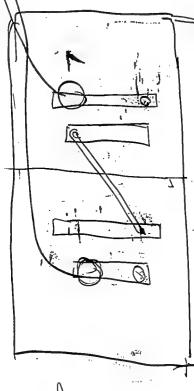
Oct 3 1878



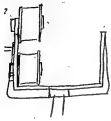
T. A. Edison,

10 & 12 WARD ST.,

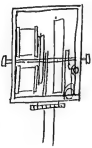
NEWARK, N. J., 187



Copy for Patents

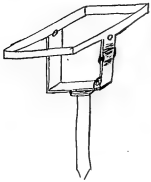


Square inside of fillet of hub but on sheet iron

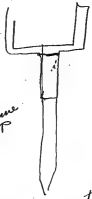


Frame a then square with arms then three arms extract arms through of the spring arm

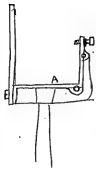
Pens. Sep. 14 1875

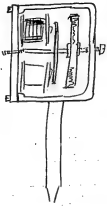


Frame made like this easy to pressure being hole or hub when chipped



A cast iron other frame
B wrought iron axle





Cast iron frame with wrought iron magnet back pressure on

(1) E. G. T. says: I have a small telegraph, consisting of a battery, consisting of a single sounder, the current being obtained from a simple battery of zinc, copper, and brass and water, etc. How could I make it work an electric light? What material would be required, and how should I arrange it? A. See p.35, vol. 32.

(2) W. C. asks: 1. Which will be the strong or of the following? Three cells of Daniers, three inches inches, surface fifteen inches, porous cups 4 inches high, fifteen diameter, and 7½ inch thickness; or a Grenet battery of 4 cells, 6 inches high, 2½ inches, and carbon plates 14 inches long. 2. To start circuit, the Siemens. One long circuit. Which is the best electric light to produce with a Grenet battery? A. Neither of the two cells. The 3d cells Daniers is the best, but the middle plate of a Grove cell sometimes made of carbon? If so, it is good as the silver cells with platinum? A. Yes. 4. Where can I find directions for making carbon pencils? A. See p. 318, vol. 32.

(3) E. G. S.—There would be no action in a battery of zinc only, arranged as you propose.

(4) A. B. says: I have a telegraph line of 4 of a mile in length with two relays on it made of No. 16 cotton-covered copper wire, 1 in. of wire in each relay. The battery is of the Leclanché and Calland pattern, six jars each. The current is strong enough to produce a very disagreeable sensation on the tongue when it is placed between the wires of the main line. This relay will not work with sufficient force to operate the sounder. I have tried a relay of 1 in. of wire, but find that the local battery will work the relay on a 2 foot circuit very well; but if I put my tongue between the wires of the local battery, I cannot discover any current passing. What is the matter with the relays, and what shall I do to make them work? A. Do you use a ground for a return wire? If so, try another wire in place of the ground.

(5) A. G. Jr. says: In *Science Record* for 1879 some one recommends chromium as a negative metal in galvanic cells. Is it used in the market, and if so, where? A. Use of what purpose? Chromium is used in the manufacture of chromic acid. Its chromium can be so deposited, when out of the metal is there that can be used? A. The chromium is not deposited upon the local electricity, but is prepared mechanically, and then pressed into the local.

(6) G. H. says: Can a lightning rod leads be protective as a conductor, either wrought or 2 years and becoming considerably corroded from exposure? It is more dangerous to use a rod than none at all? Ask these questions because our factory was recently struck by lightning, the electricity leaving the rod after passing down a short distance and entering the building, which expended its force among a lot of iron castings, which by upset the floor directly opposite the part of the wall to which the rod is attached. Its action upon these castings is shown by marks where the iron seems to be eaten as it by some acid, though the roughened surface is somewhat brighter and looks as if a small quantity of metal on the bed been deposited there. I remember that the fastenings of the rod are out of order, and therefore sender my the electricity should leave it, unless its conducting qualities are impaired. Would republishing the rod remove its efficiency? A. The upset the rod would not effect its conductors, unless the joints had been put out, their over, during power, or the rod was disbuilded in size. Rust would not affect the rod, but would affect the joints which unite its parts, and let us know whether it is still perfect, how deep it goes into the ground, and what the condition of the earth about it is in regard to moisture; also whether the rod contains any joints, or whether it is one continuous rod. What metal is the rod composed of?

(7) G. H. asks: Of what shape must I construct a magnet in order to make the most power? A. Of horseshoe shape. 2. What power can be put over square inch? A. This is proportional to the size and number of turns of the wire and the strength of the battery. 3. What ratio does the power diminish as the distance is increased? A. As the square of the distance.

(8) J. M. says: I tried to make ground connection by using two pieces of sheet tin, 18 inches square; I soldered copper wire to them and buried in moist earth about 3 feet in ground, and it would not work. Why? A. Your plates are too small. 2. Why would it work? A. Your plate was too small. 3. I made a battery in the following manner: I quart jar with cell of copper in bottom, and a zinc fitting the jar, with hole in center and suspended along the copper, with wire attached. A wooden cup was put in the jar with holes in the bottom for the blue vitriol. I let it stand about 6 hours, and it gave a current. Is such a battery issue, and what do you think of it? A. Your battery is a modification of the Daniell. We cannot see that it has any peculiar merit. 5. How is the electric light made? A. See p. 35, vol. 33.

(9) H. P. T. asks: Is there anything gained in a Gallard or gravity battery by covering the zinc with wetted paper, and how to remove the working strength of the battery? In case of accidental disturbance and mixing of the solutions, should it prevent the deposition of copper upon the zinc? 2. Had after long use the paper is covered and burnt and there with crystals of copper; but upon removing the paper I cannot see any trace of copper upon the zinc. A. If the gravity battery is properly put together, so that the fluids do not mix, there will be no local action. The paper will do no harm and not weigh good.

The Heliograph of Mr. Mance.*

By Mr. C. Mance.

Through the general introduction of Electric Telegraphy, and the all but a universal adoption of the Morse alphabet, it occurred to Mr. Mance—who has the advantage of a thorough knowledge of both, and the privilege, if it can be called one, of a long experience in a country with plenty of sunshine—to develop and improve the existing apparatus for signaling. The aim has been to produce an instrument which is very compact, very portable, easily set up, and easily worked. Although he was first in favor of larger instruments (which are still preferable for permanent stations), he is now convinced that the instrument of the size here shown is all that is requisite. The chief objection to the adoption of the non-telegraphic that we cannot connect the sun to shine in the same manner it—we can control a galvanic battery; and it must be admitted that Mr. Mance advocates his system only as an auxiliary to other systems of field telegraphy. It would come into operation at distances when other methods are useless or tedious; show, and it compares favorably with existing systems of signaling in compactness, range, rapidity of communication, and, last, in portability. The flashes are so labile to any one placed far to the right or left of the direct line, so that, from elevated points, for distant communications could be kept up a fortnight without the continuous having any suspicion of the fact.

It would be superfluous to give instances, when within the last few years the use of these instruments might have brought about the most important results.

The instrument consists of a light, but firm, tripod-stand, similar to those used for prismatic compasses. On the top a plate is moved by a tangent screw which admits of quick and slow motion, and the plate carries on a pivot a semicircular ring, which again carries on pivots the round mirror, the silvering of which is removed in the center for the space of a circle about 3-10th inch diameter. To the plate is also attached a simple key, which is pressed down and springs back like an ordinary Morse key. This key is connected with the top rim of the mirror by a steel rod, which can be lengthened—or shortened—as occasion may require—by turning the handle and screwing the rod through the small brass ball which is fastened to the edge of the mirror.

By means of the instrument adjustment and the tangent-screw the plate can be inclined, so the overshadowing position of the sun may require.

From 12 to 15 yards in front of the instrument is placed a slight-post. This rod is to mark to spot exactly in a line with the center of the heliograph and the distant station. A metal rod marks the spot, and a wooden cross-piece marks where the flash rods when not directed on the opposite station.

The instrument can be set up ready for working in a few minutes. When the exact position of the distant station is not known, a flash of sunlight must be thrown in the direction of the most likely points, and this must be continued till it is answered by a flash, which indicates that a distant signaling party is on the look-out. Then, after releasing the tangent-screw, the glass must be turned in a somewhat angle, and the sighting-rib must be directed in a line with the distant station by looking through the small aperture in the center of the mirror. When this is effected, the stud must be raised or lowered till it is in the line of vision on a level with the center of the glass and the distant flash, and the short cross-piece must be placed at right angles to the sighting, about a foot below the stud. After being thus adjusted the instrument must not be moved.

The spot will be observed gradually to rise or fall, according to the direction in which the sun is apparently moving. The handle of the key, or the tangent screw, or both, as the case may be, must be turned slightly after every ten or fifteen words, to insure, as far as possible, that the center of the spot shall be on the stud when the key is pressed down.

When the sun is rather low in the heavens, and behind the sighter, it becomes more difficult to direct the flash with accuracy. In consequence of the obtuseness of the angle the spot loses its circular form, and becomes rather elliptic when reflected on the stick. If it is required to work frequently with the sun in this position, the employment of a second plate on a light tripod stand is recommended.

But it would be useless here to enter more into the minutiæ of working the instrument: suffice it to say that, in experienced hands, twelve words and more per minute have been obtained, while others state that non—after a fortnight's practice—could attain only from four to five words per minute. As to the distance, 10 and 20 miles—and in very clear weather 40 miles—have been obtained.

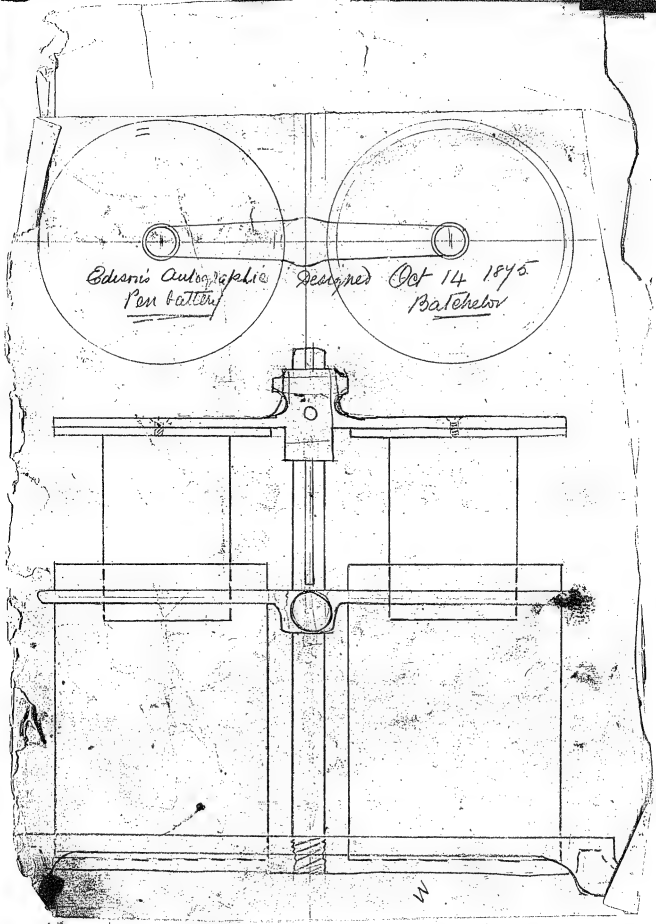
A number of officers of the Indian Army have tried and reported upon the instrument, and—with the exception of one—all report most favorably of the system as an auxiliary to existing systems, and efforts are being made at the present moment to insure their adoption for the Indian Service by the authorities.

*Read before the Society of Telegraph Engineers.

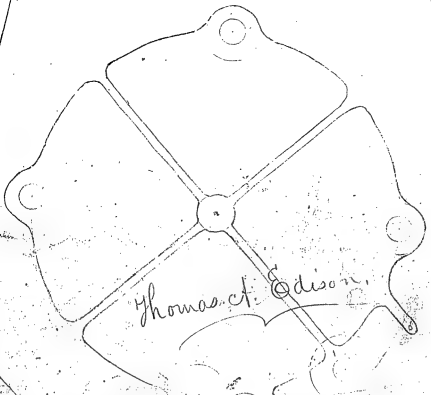
The Magnetism of the Earth.

(9412.)—In letter 9370 "Elektron" asks "What does magnetism go to show? Is it not that the interior of the earth is all molten fire?"

Answer—No. That theory has long been disproved by two witnesses, at times active, within the last 50 years, namely, the Magnetic Needle and Gravity, the latter showing that by its attraction the Magnetic Needle, the shape of the earth also proves that the interior portion must be much more dense than the observed density of the so-called "crust," which indicates that it must be solid or nearly so. Lastly, a homogeneous mass, rotating with the velocity of the earth, would remain distortion in the proportion 230 to 229 between the earth's polar and equatorial diameters, and not 300 to 301.


Edison's Autographic Pen Pattern
Designed Oct 14 1895
Batchelor
W

Dec. 17th, 1895



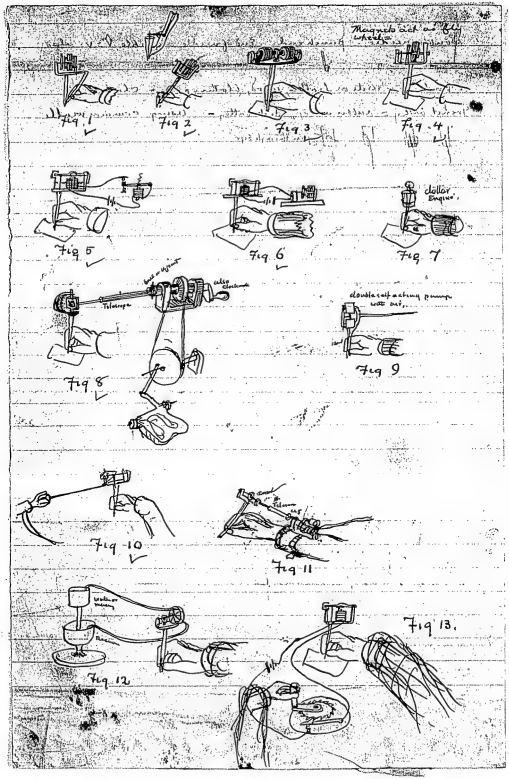


Fig 1
Fig 2
Fig 3
Fig 4
Fig 5
Fig 6
Fig 7
Fig 8
Fig 9
Fig 10
Fig 11
Fig 12
Fig 13.

Darning needle: punched end. End of needle a double l. v. also

= work = write on leather, wood, blotting paper - cloth

Implint battery = rubber w/ top, ink battery - wooden, common needle

pen through eye.

Fig 14

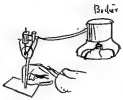


Fig 15

Fig 16.

Ink roller – Cloth dusks; wound yarn. felt Rollers coun Swett cloth a
Printers rollers; do count wett cloth, compressed sponge, soft leather
Rubber sponge a

Fig 17

Fig 18

Fig 19

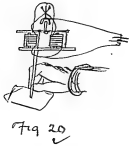


Fig 20

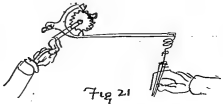


Fig 21

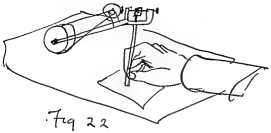
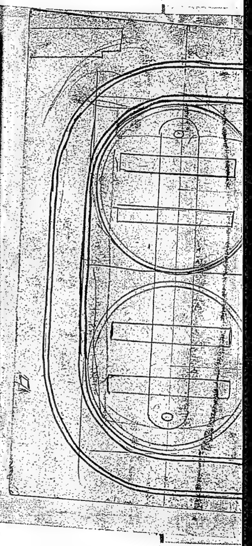
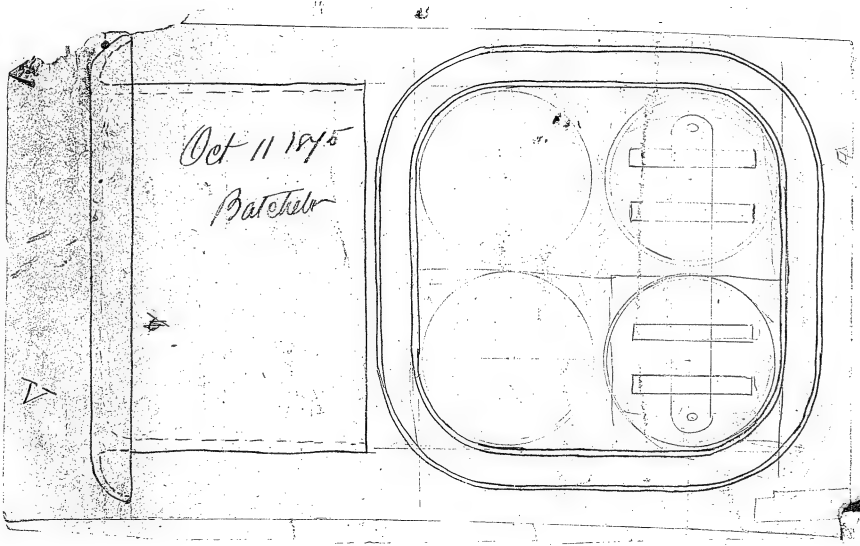


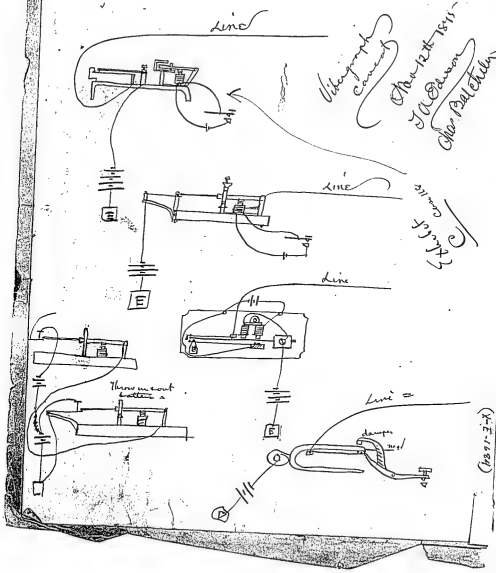
Fig 22

Fig 23?

Pen Caveat




Oct 11 1945
Batchelor


Line
Line
Line
Line
E
E
E
Throw me out
Letter A
Line B
Sounder
Relay
Battery
P
(Acct. Bkg.)

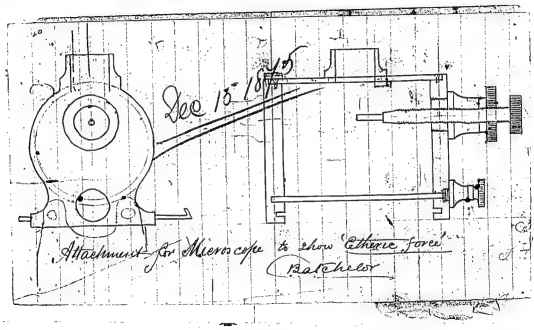
No. 24

Wind from pan

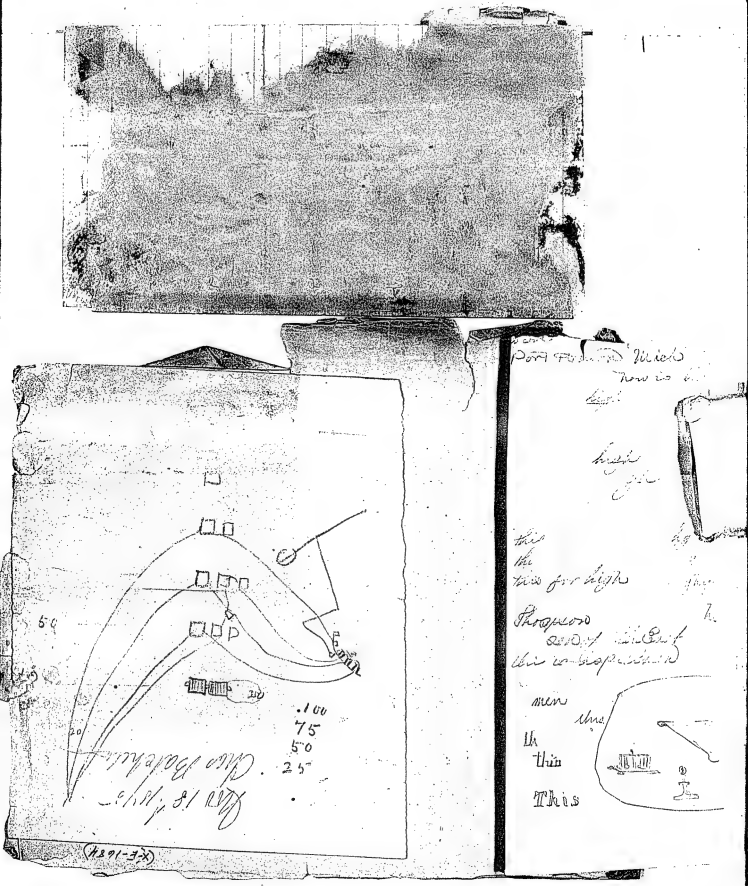
Opposite A.

perfect on 1½ Cells testing on
Prachy No 24. coil 45°.
Works little and below on 2
old 1½ cells with chalk jar
on the turn from yellow to brown
or green below 40°. If turned not be
on low facing. — on new battery
testing 59. gives fan fixed
front drive extraordinary
with large deviation =

Dec 18th 1895
Chas Batchelor

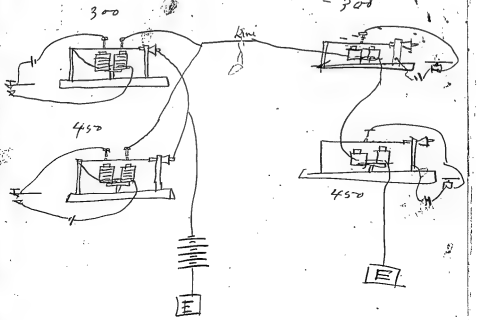


Attachment for Microscope to show Ether force
Batchelor


.100
75
50
25
50
20
20
Proposed
This

T. A. EDISON, 10 & 12 WARD ST.,

NEWARK, N. J., 487



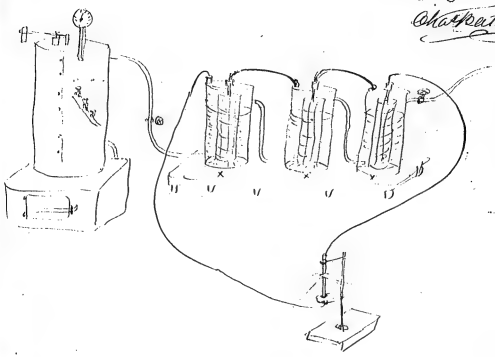
Laboratory Scrapbook, Cat. 1146

This scrapbook covers the period October 1877-December 1880. The notes and drawings are by Edison, Charles Batchelor, John Kruesi, and Samuel D. Mott. All relate to electric lighting, except for a note on the telephone, dated July, 1878, and a drawing of ore milling apparatus, dated April 20, 1880. Many of the drawings and notes were prepared for caveats or patent applications. On the back of some of the notes and drawings there is a page/volume number, indicating that they were removed from the sequence of numbered pages in Unbound Notebook, Vol. 16. Some of the material in this book has also been copied into Experimental Researches, Vol. 1. The book contains approximately 140 unnumbered pages.

Oct 1877

Dynamo Voltaic apparatus.

Oct 24 1877
"SR Edison"
Charles Batchelor



X X X are cast iron boilers with a cylindrical neck in middle fitted with pressure gauge & safety valve. Carbon the iron cylinders in about 7 feet high 3 feet diameter. They are connected together in series by boilers. They are filled 2/3 full fresh water or water containing any other ingredient or condensed steam or SO_2 = leading from a 20 horse boiler one from which passes through the pipe and injects it keeping it depolarizing. Our experiment lasted was successful with the exception of galvanometer in electrical energy and constant deflection was had varying from 10 to 60 without water to 40 with steam & zinc & iron & water.

T. A. EDISON,

Menlo Park, N. J., 1880.

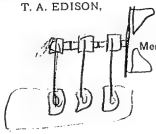
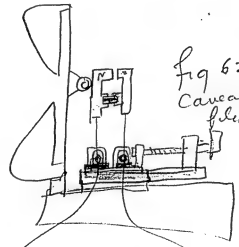


fig 86.
Caveat 76

fig 62
Caveat 76
filed Mch. 1876



83-

fig 83. Caveat 76

fig 28

4 4

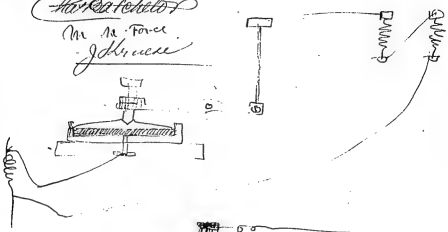
Electric Light April 14 1878

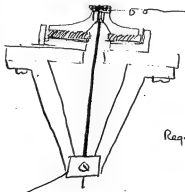
Thos. A. Edison

Hon. Rutherford B. Hayes

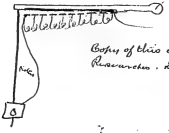
Mr. Ex. Force

J. H. Wade





Regulating by Tachometer principle.



Copy of this on page 16 Vol. 1. Experimental Researches. Sept. 25. 1878

Wm. Carman

July 1878

T. A. EDISON. Telephone

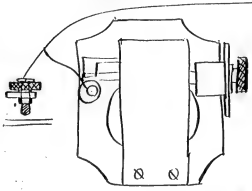
T. A. Edison

Menlo Park, N. J. 187

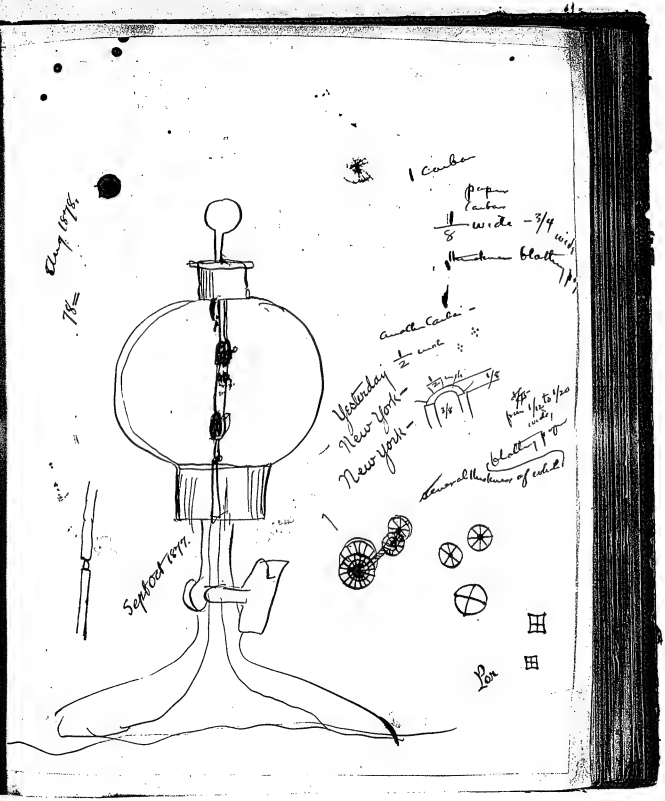
J. Krusi
July 1878 Force

Krusi.

This must have a cam and thumb nut to lift out the worm so as to put in fresh pieces It can screw on with shoulder screw



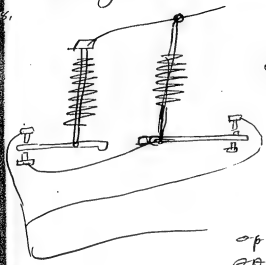
Batchelor


1 Carbon
Paper
Carbon
1/8 wide - 3/4 wide
Another Carbon -
1/2 wide
Yesterday -
New York -
New York -
3/8
3/5
3/8
from 1/32 to 1/50 wide
Sketch
Second Mechanism of vehicle
Sept 22nd 1877.
Aug 1878
Year

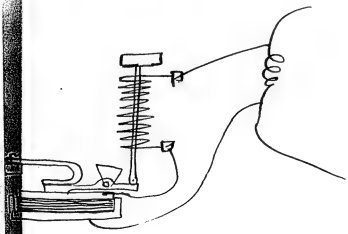
Sept 8 1878

Thomas A. Edison

Electric Lamp



It may be possible that one regulator at the Central Station may be made to do it for all the main current being regulated by the heat of a large spiral so that as the current slightly rises to a point approaching the melting point of all the spirals that it will be opened by the effect of the spiral at the Central Station.



Carbon discs

or other form of Incandescent,

Sept 9 1870 J. C. Ham

Charles A. Tichnor

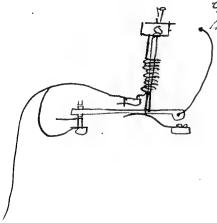
Electric Light

" C.

C. E. Carman

M. N. Jones

J. Hinckel



Wallace.

500

Million

1000

500

Wallace

25,

Portland

Wallace

100,

Wallace

Wallace

Boston

Wm Wallace

Wallace

Wallace

Wallace Wallace

Wallace Wallace

Copied on page 181. Vol 1.

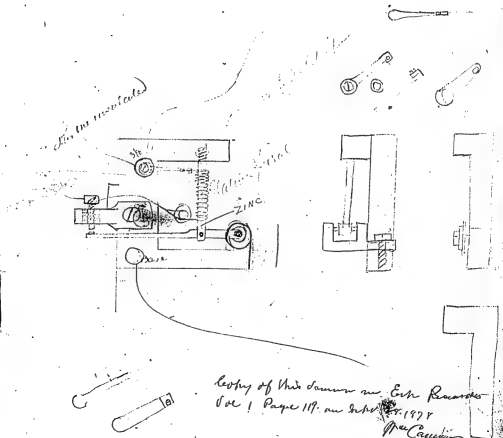
E. F. Rounds Oct 9. 1871

Wallace

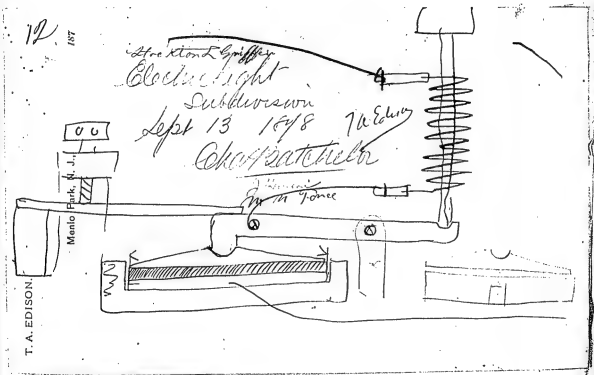
Wallace Wallace

Electric Light Sept 10 1878

Stockton L Griffin
Chas Batchelor
T A Edison
J Kruesi
M N Force



Copy of this drawing in Exh Records Vol 1 Page 119 on Sept 28 1878
Wm Carman



Copied this on page 122 Lab. Notebooks Vol 1
30th day of Oct 1878
Wm Carman

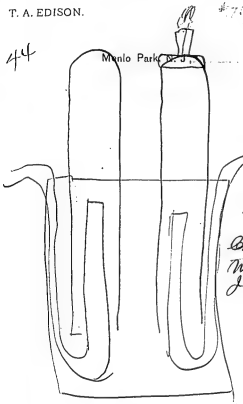
Electric Light Subdivision

Sept 23 1878

T. A. EDISON.

44

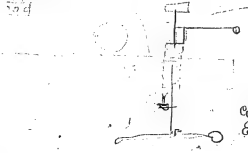
Menlo Park, N. J. 187

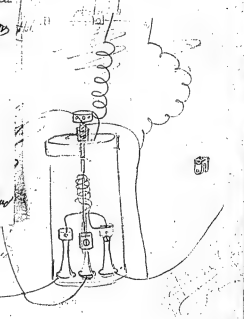


Electric Light
Nov 27 1878
Stockton Griffin

Chas Batchelor
M N Prince
J Kruesi

Copied on Page 1100 Vol 1. Exp Book
Oct 2. 1878 M Pannell



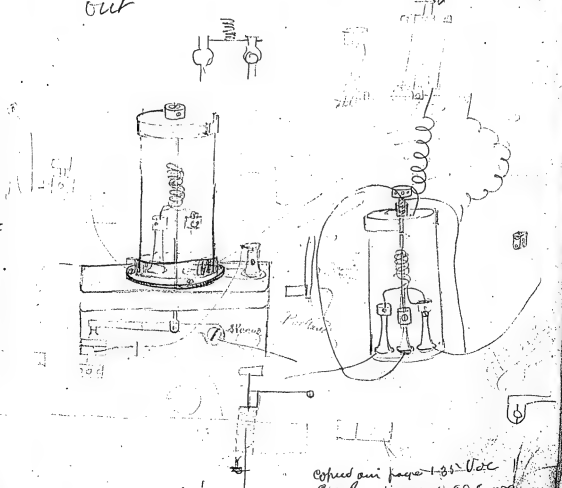


Copied on page 1 Vol Exp Book Oct. 1878 M Pannell

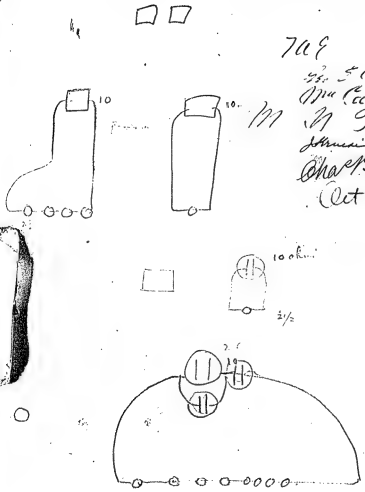
91/92

Sept 23 1878
Application filed
A Edison
31
Phonograph or Talking Machine
J Krueger
M M Force

Double coil fastens both at one end
expands lengthwise instead of bulging
out



Copied on page 1-31 Vol
Exp Book Oct. 1878 M Cowan

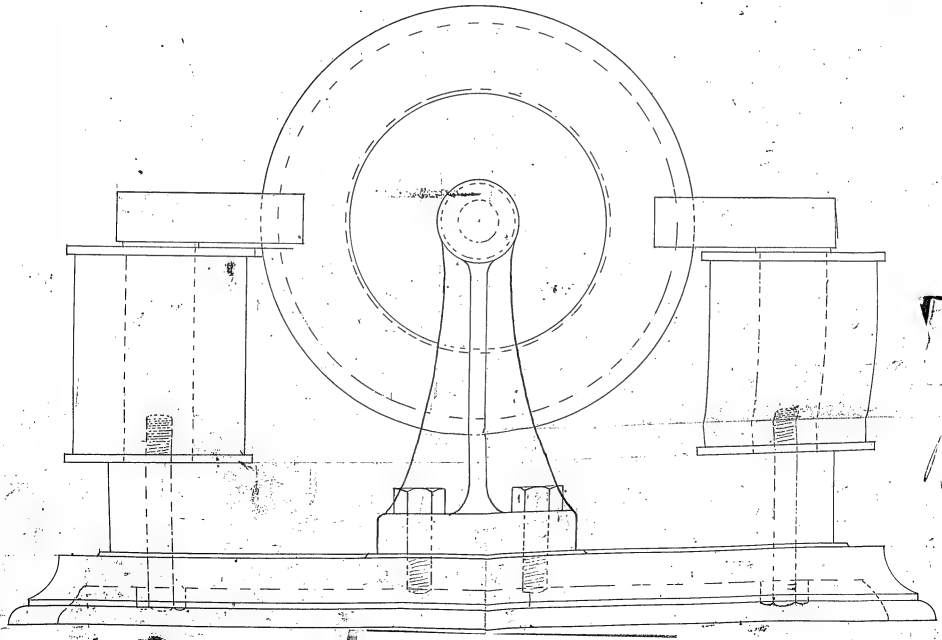


7a8

Gen E Carman
Mr Carman
M Force
Johnson
Chas Batchelor
Oct 26 1878

5 10

Edisons Dynamo
Nov. 17



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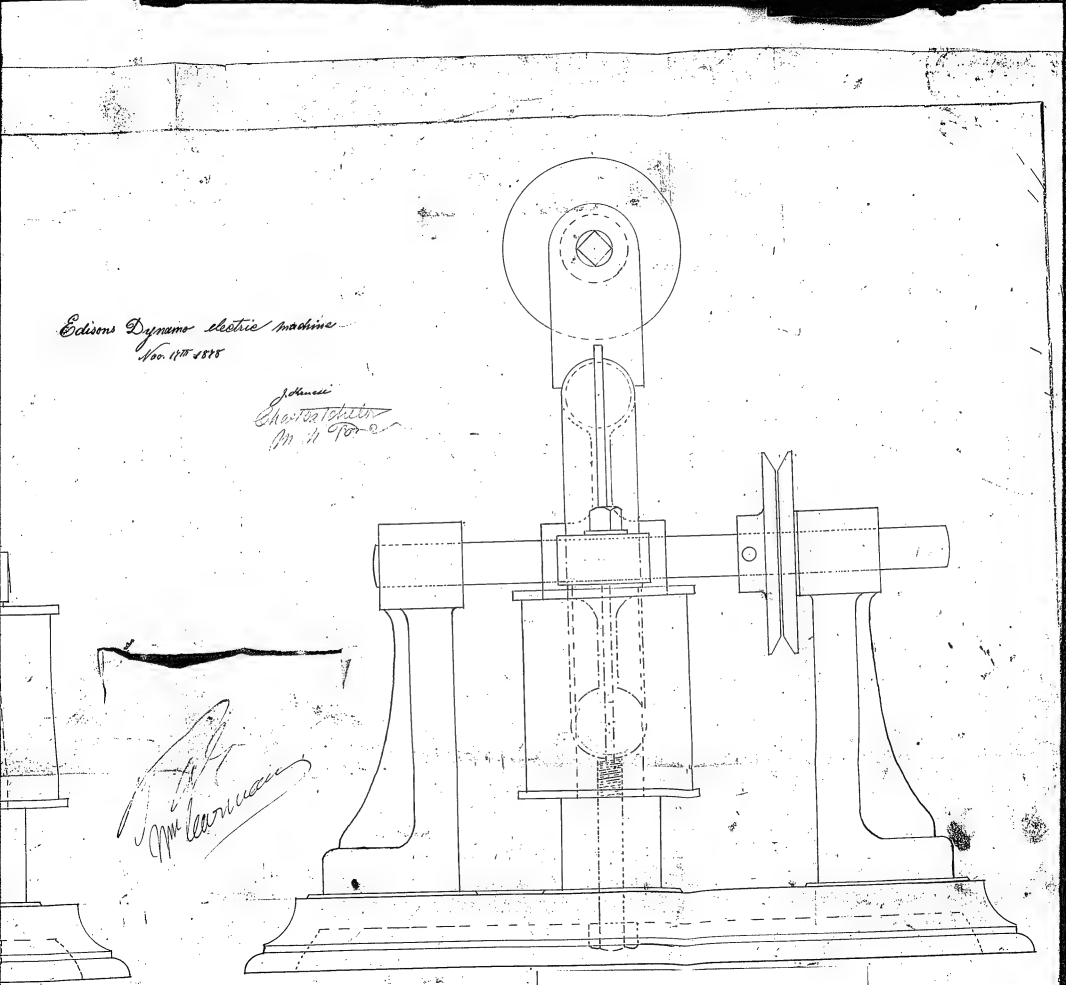

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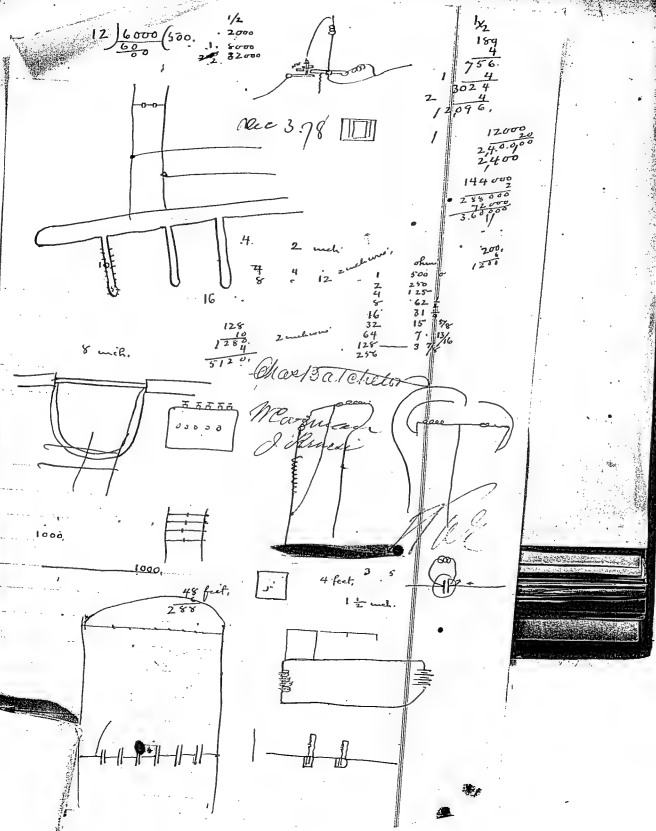
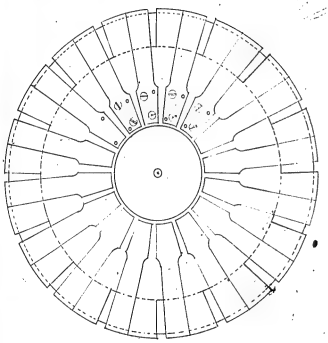
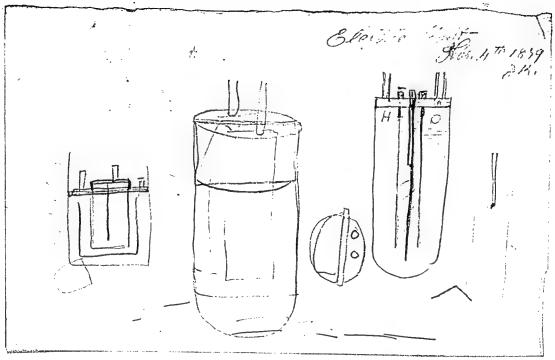

12)6000(500.
Rec 3.78
4.
2 mch.
16
8 mch.
2 mch.
2 mch.
1000.
1000.
48 feet.
288
4 feet.
1 1/2 mch.
Chas B. Coleman
Marquand
J. Kunzli

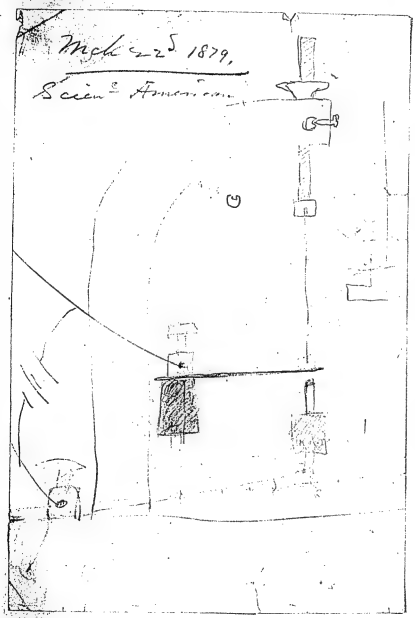
— January 1879 —

Only 12 springs
No 16 —
Board

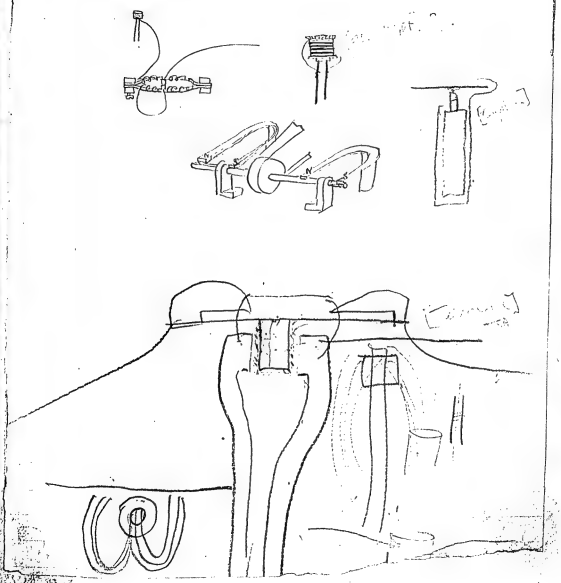



H
O

$\frac{364}{16}$


Mch 22d 1879.
Scien. American

addition to Great gun
Smith. March 28 1879.

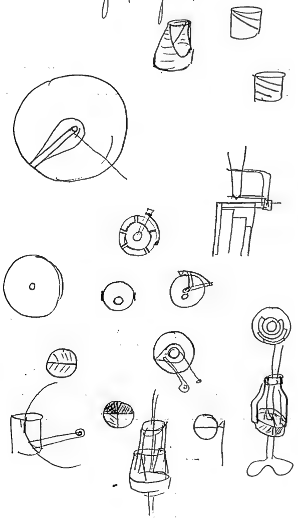


1 copies of
the pamphlet

B. L. Abbott
Jr. Albany 9th 7m

O. Kittmotes

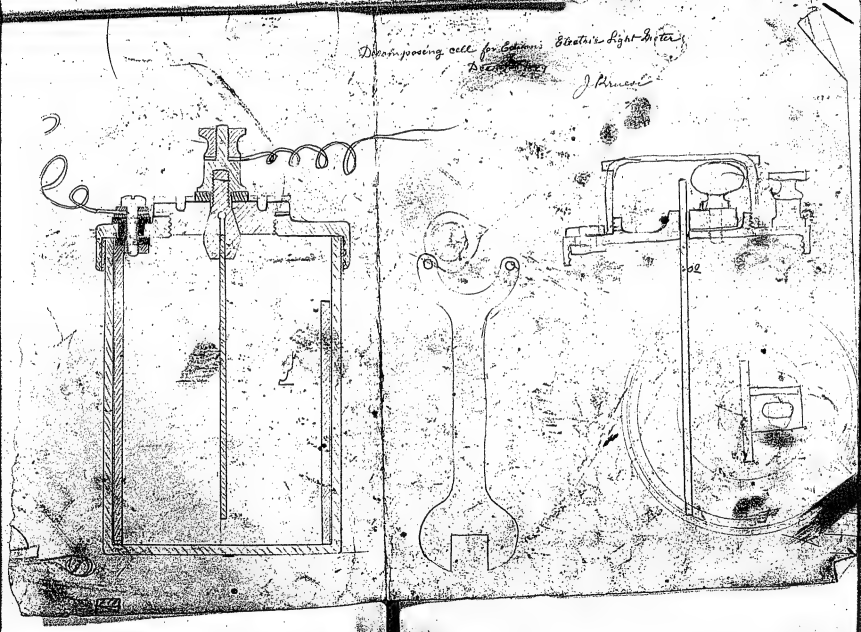
Jigger for E.L.
July 31 1879
TAE



Decomposing cell for Edison's Electric Light Meter

Dec. 1879

J. Princell



Menlo Park, N. J., Dec 19th 1879

English

~~Provisional~~ Provisional Protection

(want to file) US Consul

In my system of Electric Lighting, I have proposed ~~to~~ in a previous patent to Regulate the pressure or Electromotive ~~force~~ force at the Central station by varying the ~~strengths~~ strengths of the Field magnets around the induction bobbins connected to the main Conductors ~~in~~ ~~drop~~ rise or fall in the Electromotive force due to putting on or off lamps being indicated by an Electrometer; I find that an Electrodynometer similar ~~to~~ that of Webber but of high resistance

Menlo Park, N. J., ... 18

2

is ~~preferr~~ an improvement upon the Electroplate owing to its greater reliability.

In my system a City is divided up into districts in each district there is a Central station, which station is provided with suffficient Machine power & ~~Machine Machine~~ ~~Magnetic~~ Electric generators to supply half a mile radius, at this station I employ say five Engines Each of 250 horse power, Each Engine runs by a belt a seperate line of shafting on this shafting is bolted

Transformers of 1000 to 2000 candle power (Lamps included)

Menlo Park, N. J., ... 18

3

say 40 electric generators, so that each engine & its system of generators may be considered complete within itself = 2 large rods of copper are conveyed in proximity to all the generators and connecting wires are arranged so that any generator may be placed in mains & feed into the two main conductors, all the generators so been connected to the mains are connected in multiple arc and the field magnet of every generator is so wound the size of the pulley upon shaft made such a diameter that either by increase

orders and [illegible]
or by a weakening or strengthening
of the field magnet the
electromotive force of the
induction coils may be
adjusted to vary
gradually the same
electromotive force as
all the other machines
employ several subsidiary
electric generators bolted
on the shaft of the first
engine which is all in use
and the current from these
machines is conveyed by
leading wire to the field
magnets of all the
generators & serve to keep
a constant field

4

A second series of these subsidiary machines is connected to the shaft of the engine and connected in duplicate to be used in case of emergency or in case the other fails to give steady [illegible]. A switch serving to change one subsidiary generator from one set to another so the change can be made gradually. The subsidiary generators are also arranged in multiple arc but the field magnets of main line generators are so connected that there will be a row of

Say 10 magnets connected in series and these sets connected in multiple arc. Switches are provided whereby any 10 field magnets are disconnected at once the induction coils having previously been disconnected from the mains for energizing the field magnets of the subsidiary generators I use a dynamo electric machine, the current from which passes through the field magnets of all the subsidiary generators either in series or in

Menlo Park, N. J., ... 18

7

multiple arc in this
Circuit & place a large
number of resistance
Coils of large wire and
subdivided so that
each has say $\frac{1}{50}$ of an
ohm a wire between
each resistance coil leads
to a Commutator which,
in turning short circuits
as great or less
number of Resistance
Coils, thus increasing or
decreasing the strength
of the Current in the
Electromagnets of the
on board by generators
This in its turn increases
~~the strength~~ or decreases the
strength of the Current

Menlo Park, N. J., ... 18

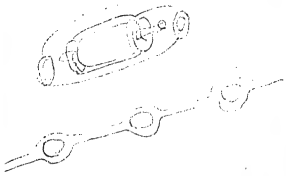
8

in the induction Coil when
the current and this
current in its turn
increases or decreases with the
strength of the field
magnet of the main
line generator &c.
a rise or fall in the
pressure or electromotive force
of the current according
as more or less energy is
drawn from the generator
station by putting on
or off lamps or electric motors
&c &c.
Thus I am enabled to
cause a rise or fall in the
pressure or electromotive force
by turning of the commutator
handle. To indicate the

Menlo Park, N. J., ... 18

rise & fall of Electromotive
the Operator at the Commutator
has before him the [illegible] dynamometer
~~also~~ ~~and~~ as well as several standard
lamps to indicate the rise
& fall.
This apparatus I propose to
place in a room disconnected
from the main Rooms containing
the generators & Engines, the
connection therewith being
made by wires. But the
movements of the Commutator
is transferred by gearing
& shafts to a large
dial placed in the ~~the~~ one
~~the~~ generator room &
one in the Engine room
so that the Station
Master may know

the proper time to start up or stop down one or more of the engines.
It will probably happen in practice that from the breaking of bolts or wires or other causes that one a generator will cease to pass electricity to the main although the induction coil then be intact this will cause the current from all other generators to cause this generator to reverse its motion & perhaps burn the wire, to prevent this I interpolate a short wire in the induction coil current made of Bismuth



~~will meet~~ ~~[illegible]~~
wire of the g[illegible]
[illegible] too great a heat
is reached,
Between
Each Generator ~~is provided~~ is placed
~~with~~ a loose pulley on
a stud upon an upright
upon which the belt may
be moved in case a
generator is to be repaired
when the battery of generators
of which it is one is
in use;
~~This will know that~~
At different parts of the
main circuit outside of
the ~~[illegible]~~ generating station,
~~place~~ Electric Engines
almost omni[illegible] to the

fusible metal which will melt & save the wire of the generator too great a heat is reached,

Each Generator is placed ~~with~~ a loose pulley on a stud upon an upright upon which the belt may be moved in case a generator is to be repaired when the battery of generators of which it is one is in use,

It is well known that all different parts of the many Circuit outside of the ~~Central station~~ generating station ~~place~~ Electric Engines almost similar to the

(12)

may be placed
generators, for the purpose
of ~~[illegible]~~ equipping
out power to all a[illegible]
I find that Engines giving
varying amounts of power
from 20 horses to $\frac{1}{20}$ of a
horse may all be
worked in multiple arc.
The less the power required
the smaller the wire and
the greater ~~must~~ length of a
finer wire need be used that for
a larger power; & I find
that it is practicable to
place the ~~larger portion~~ greatest length
of the wire & resistance
upon the field magnet.

In using these small machines
in multiple arc for running

15

a sewing machine I arrange a clutch for disconnecting the machine from the circuit, a belt to connect the motor with the sewing machine, using a very small pulley on the motor & a large pulley on the sewing machine so as to allow of high speeds in the motor, I regulate the speed of sewing by a friction lever pressing on the driving pulley of the sewing machine which lever ~~may be~~ being connected to the foot rest may be pressed lightly or heavily on the

Menlo Park, N. J., 18

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pulley of the generating
machine & thus
reduce its speed when
we stop it all together,
the pulley of the water
being a friction pulley
allows the water shaft
to revolve at a slower
speed even when the
belt is slipping.
When the motor is
arranged to pump water
to a tank I use a float
which when the water
becomes too low closes
a circuit & connects
the motor to the
main line, and when
the water is sufficient
another float turns

Menlo Park, N. J., ... 18

15

15th to disconnect the motor from the circuit ~~then~~ for running machinery ~~shaft~~ with these motors & where an even speed is required. I arrange upon the shaft of the motor a governor ~~with~~ ~~a~~ ~~lever~~ the ordinary ~~another~~ manner and which when the speed has reached a certain point causes a lever to open the circuit & disconnect the motor from the circuit. ~~this point when~~

these motors work ~~upon~~ upon the same main

Menlo Park, N. J., 78

16

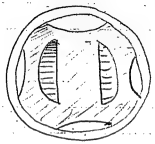
Conductor to the lamps.

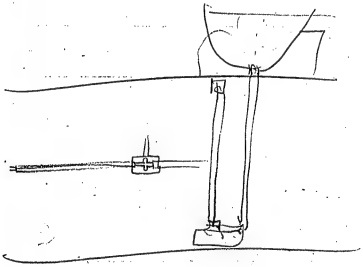
Clarion

Dec 19

Recorded in Book 5 pg 127

Feby 7 1880





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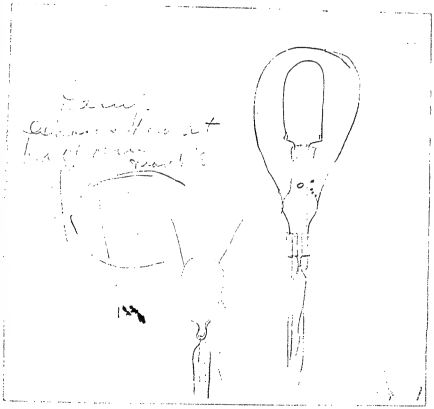

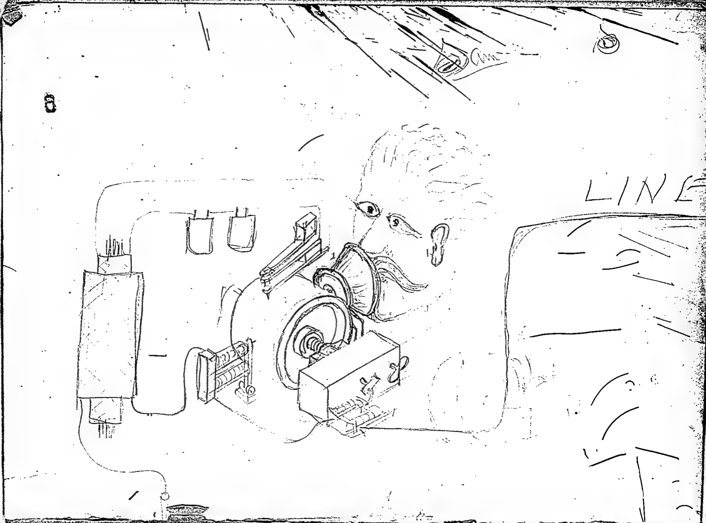
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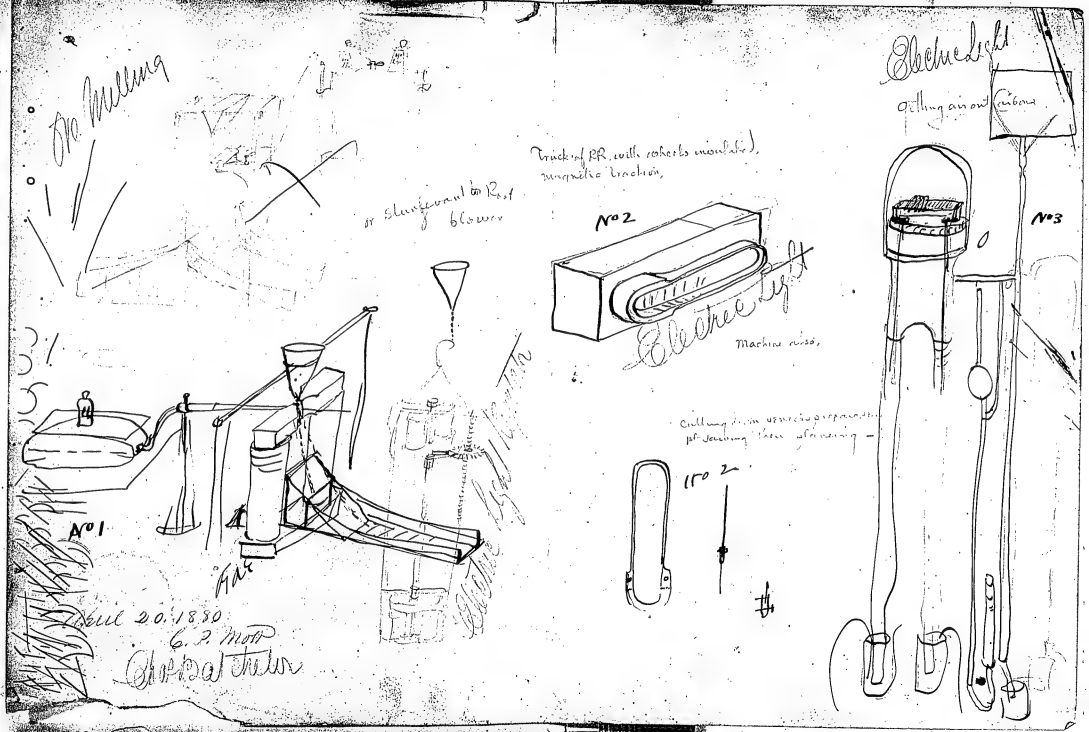
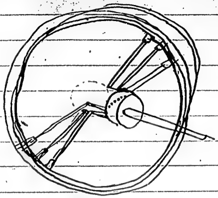
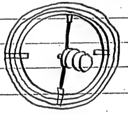
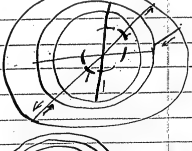
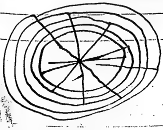

Electric light
Truck of RR. with rotarts mounted,
magnetic traction,
or steam engine to Rest
blower
No 2
Electric light
Machine room,
No 1
No 3
Electric light
Cutting air and furnace
Cutting from upper circle or grapnel
pr Jacking them off working
Iron
April 20. 1880
6. 2 mon

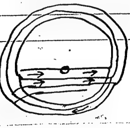


May 16 1881 TAE

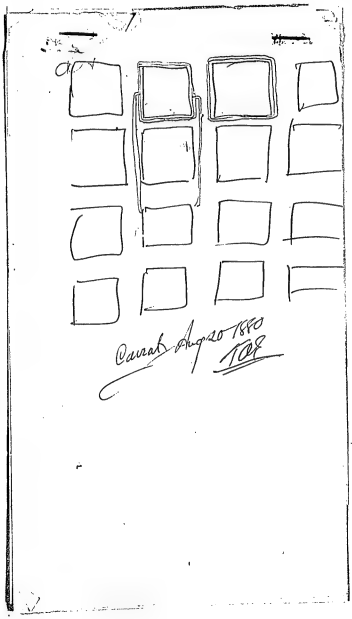


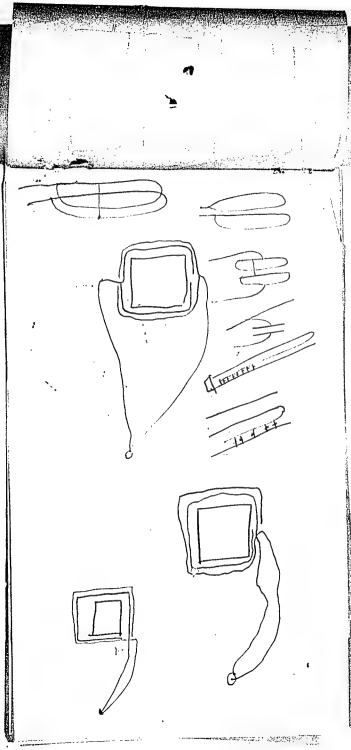


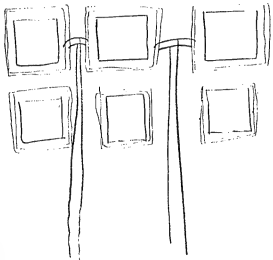


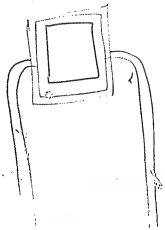


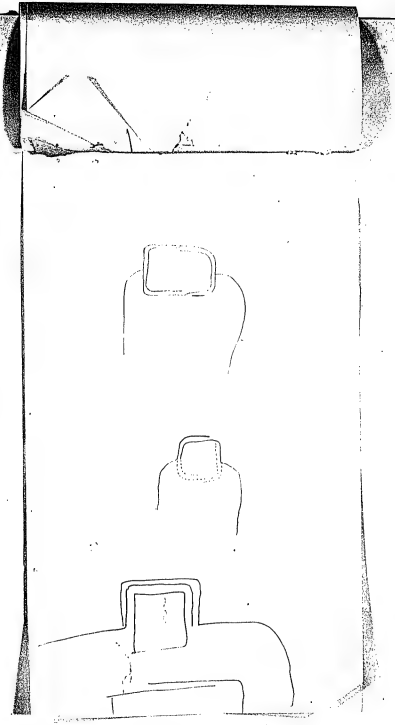
August 1880

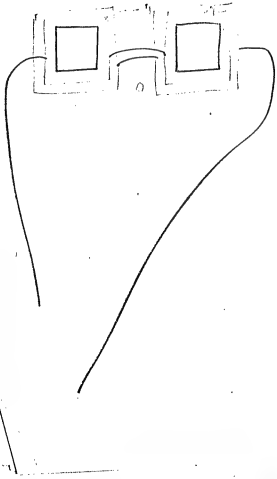


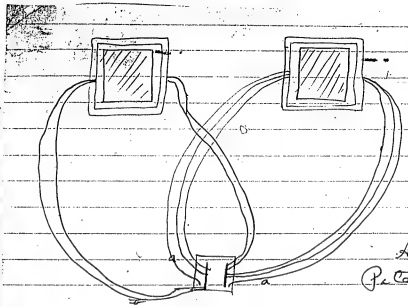






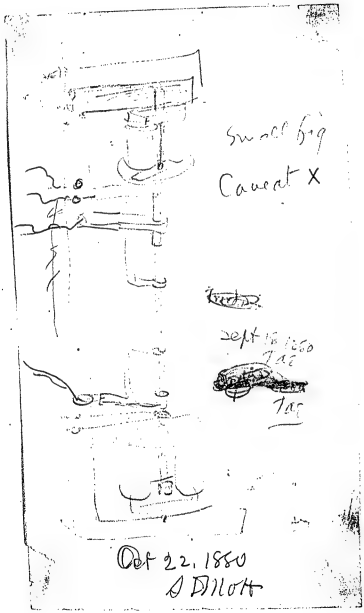






Aug 24 1880
P. Cook

~~Suppose~~ One block using more than other block, or rather a section of block using regularly a larger no of lamps than another section, I prevent drop on the heavy block by adding an extra section of cards, a in lieu of running the EMF which would tend to raise the lights in the poor block abnormally —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Sept 16 1880
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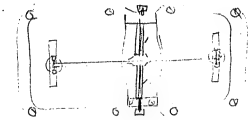
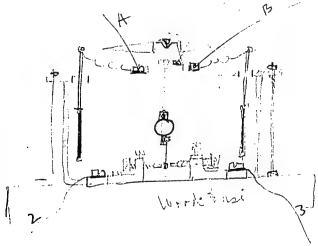
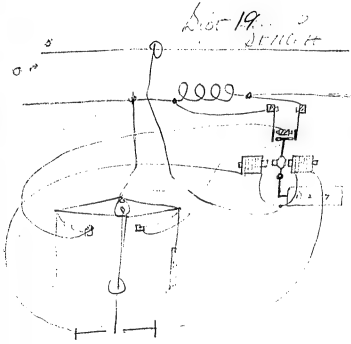
T. A. EDISON.

Menlo Park, N. J., 1880.



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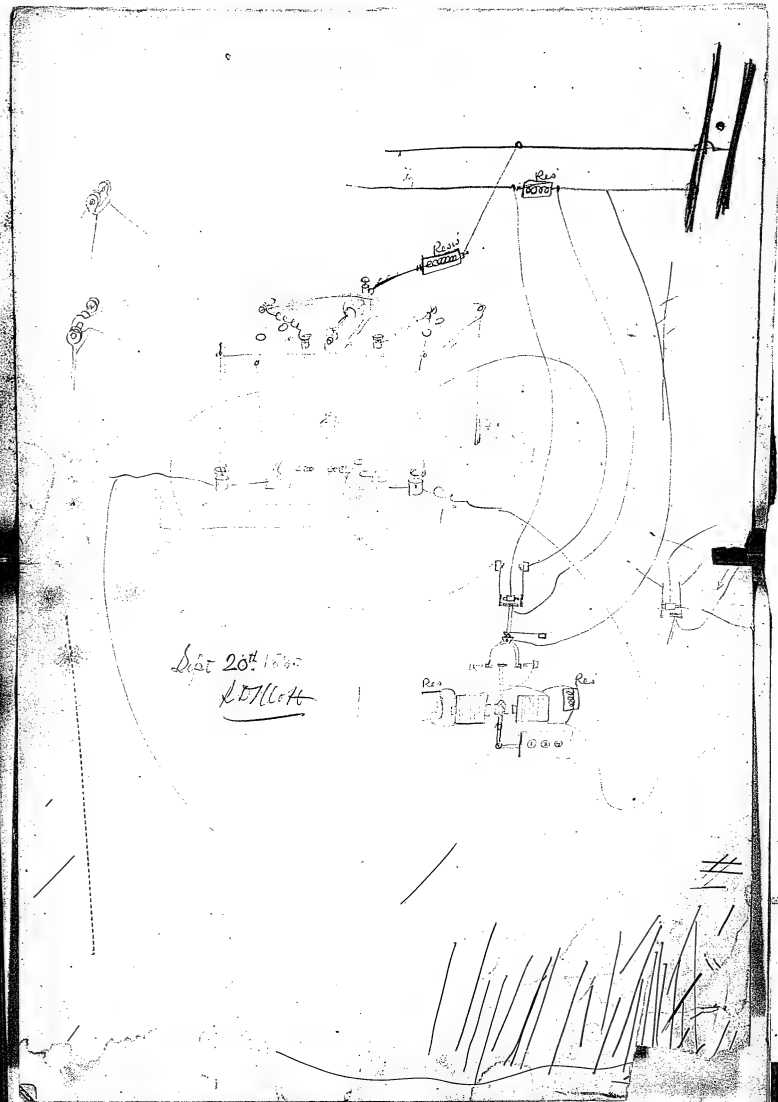
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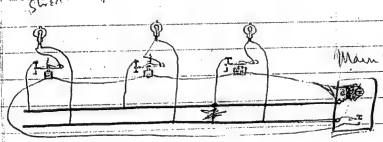

Patent

Sept 21st 1881

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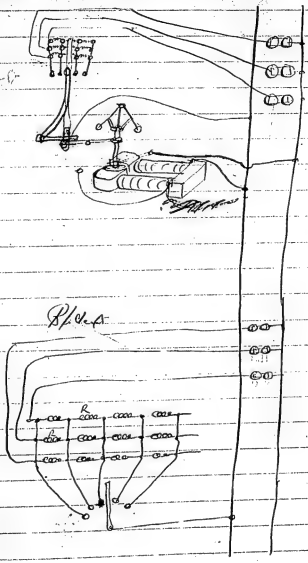


Witness

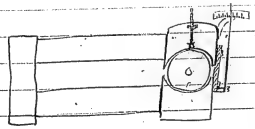
Patented

Sept 21. 1880

A Miller

September
1880

Sept 21 filed
patented



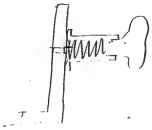
Patented

T. A. EDISON.

Menlo Park, N. J., 1880.

Get complete dockets different styles.

Patent —



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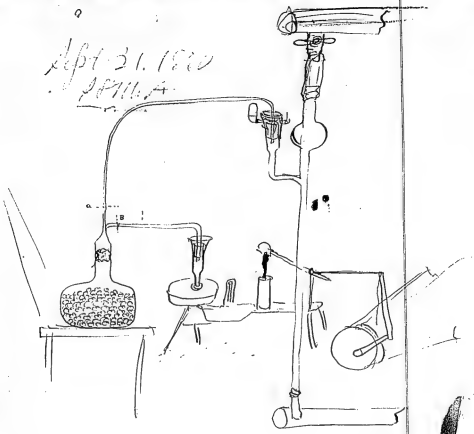
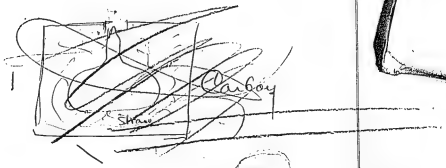
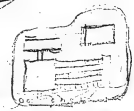
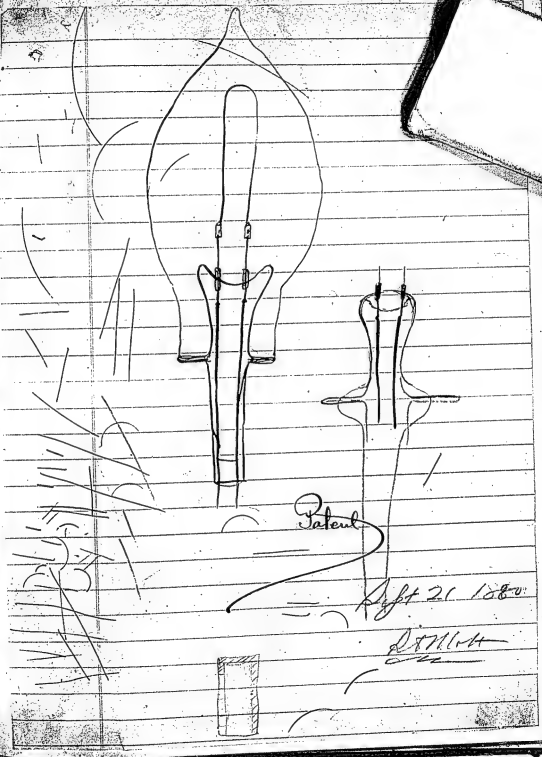
Patent





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Sept 21 1880

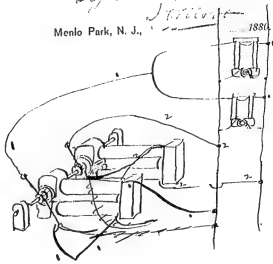
T. A. EDISON,

Menlo Park, N. J.,

Apt 211

Sheet 1

1880



Patent

The Edison Speaking Phonograph Company,

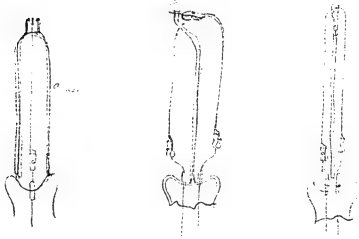
66 READE STREET.

GARDINER G. HUBBARD,
President.

E. H. JOHNSON,
Sec'y & Treas.

New York, Oct. 6 1878

Page 11



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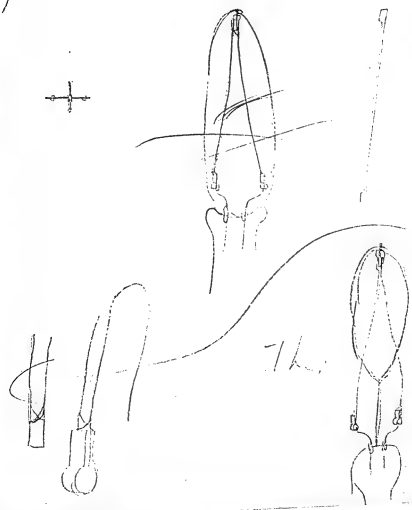
Page 2



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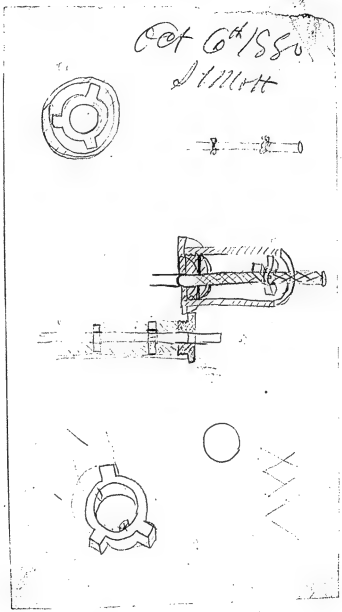

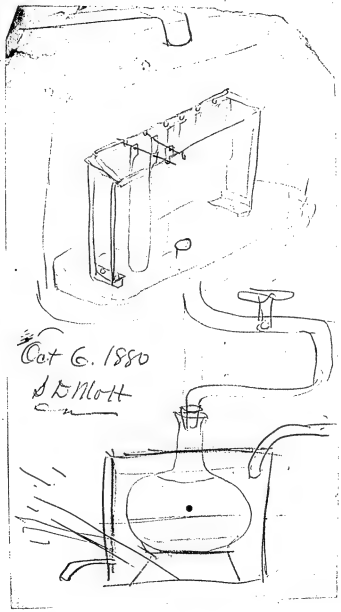
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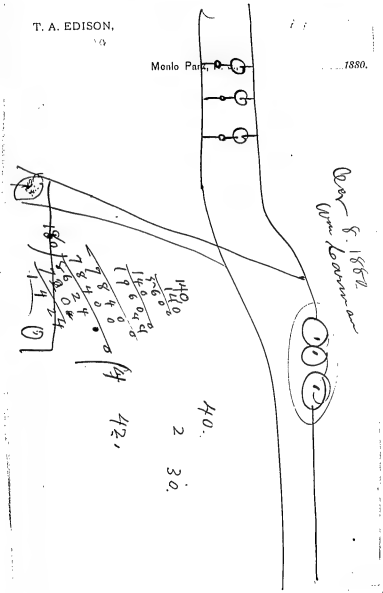
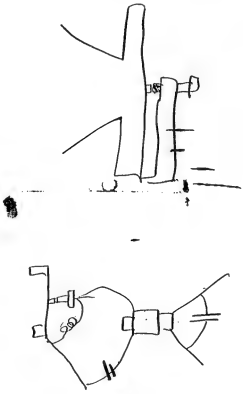
T. A. EDISON,

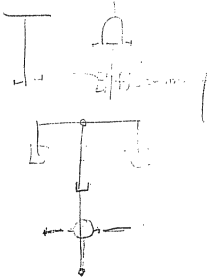
Menlo Park, N. J. 1880.



T. A. EDISON.

Menlo Park, N. J., Oct 9 1880.





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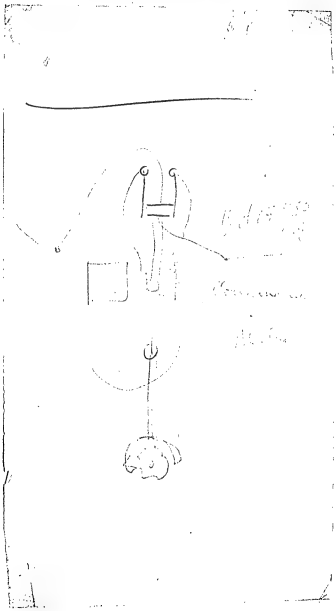

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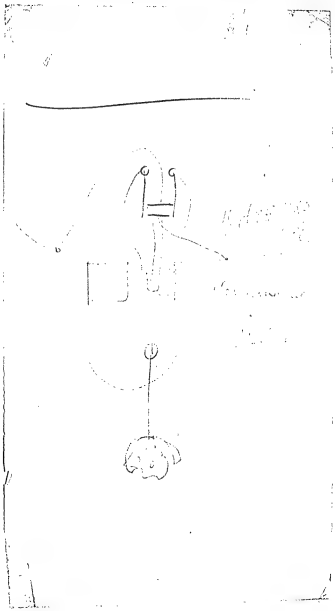
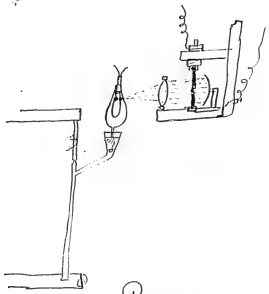




Patent

Oct 19 1880

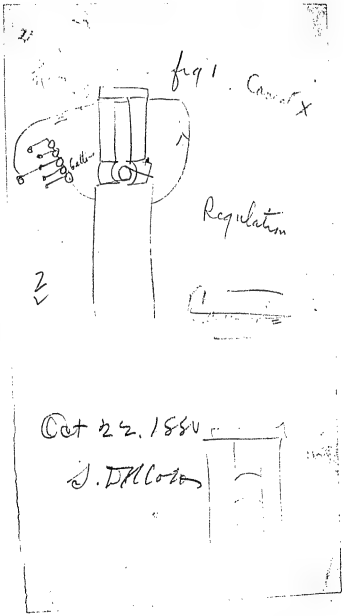
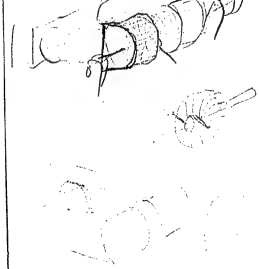


fig 1. Cam of X
Regulator
Oct 22. 1884
J. McCoy

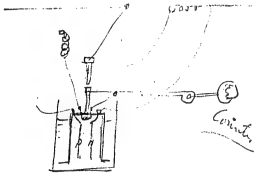
Cancer X'

fig 3



Oct 22 1880

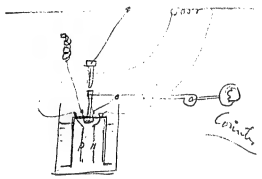
[illegible]



Patent

Oct 22. 1880

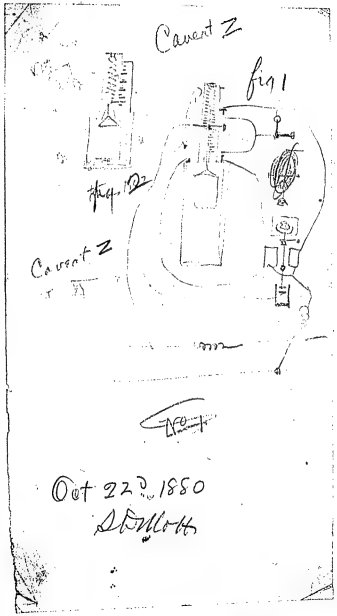
A F Moth



Patented

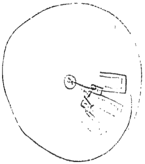
Oct 22. 1880

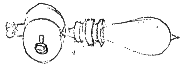
A F Moth


Caveat Z
fig 1
fig. 2
Caveat Z
Oct 22 1880
D Bollock

Oct 22. 1860

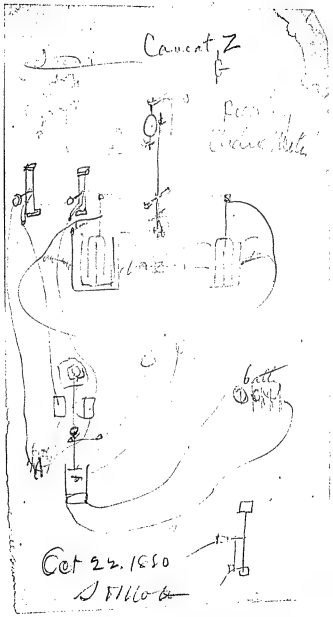
[illegible]

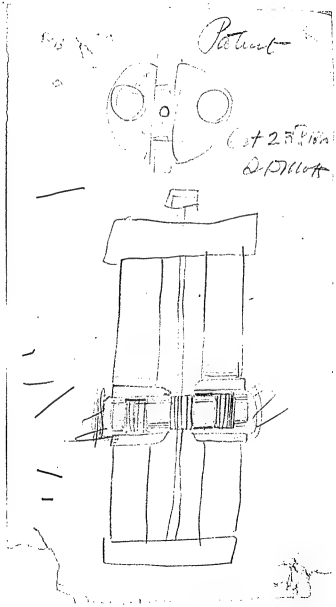




Oct 22 1880

S Tilloton

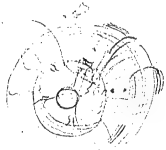

Caucat Z
batt
Oct 22. 1880



October 1880

Oct 23rd 1880

A Elliott



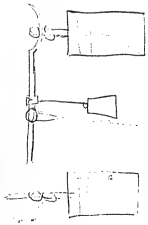
Pistol

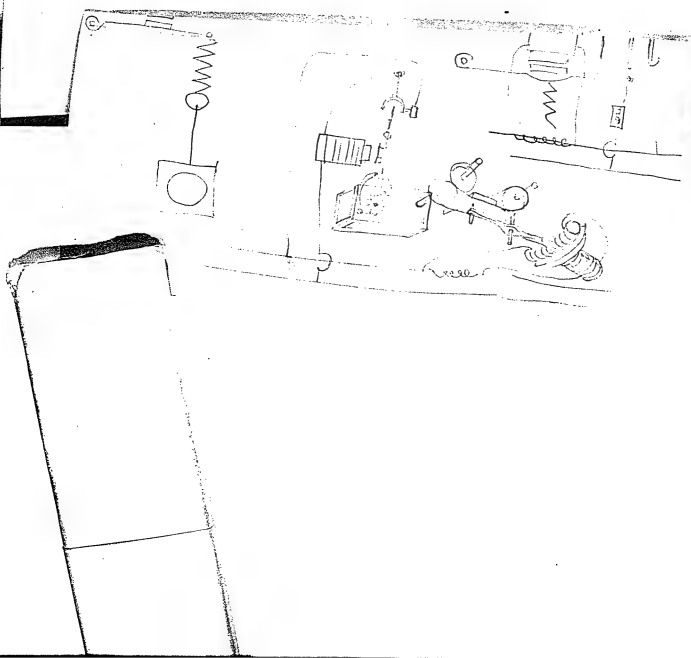
Mr. Edison Nov 24 1880

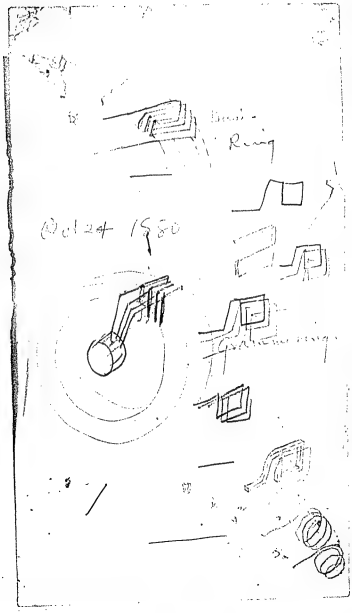
Received from Mr. Edison to be applied on a note holding one [illegible] Dollars

S. D. H.

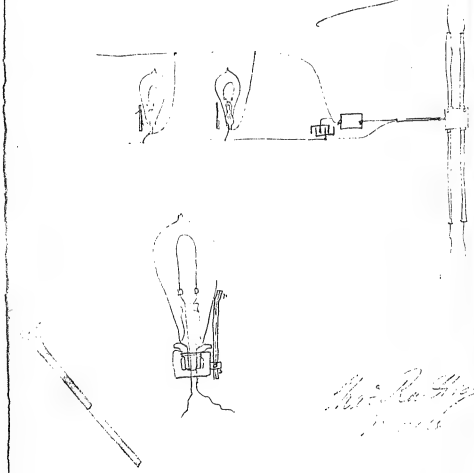
"Direct Economic ~~[illegible]~~ thoroughly applied and patent is a great Enterprise"



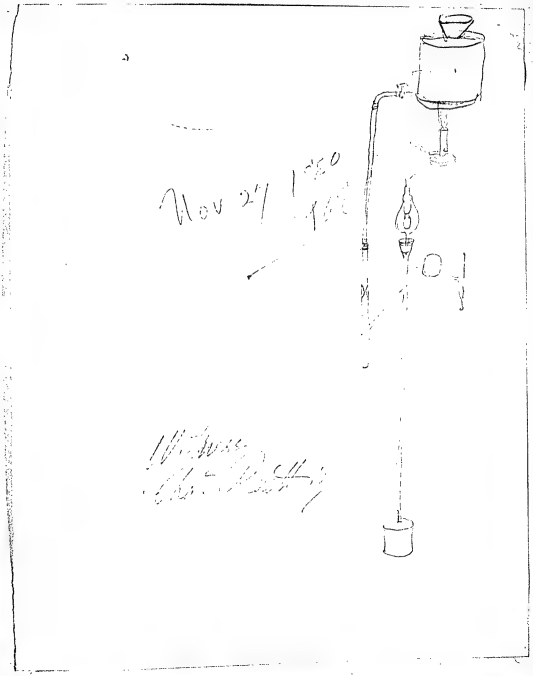



Ring
Oct 24 1880

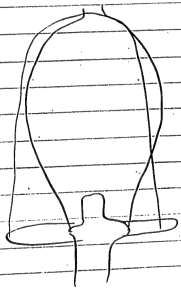
10 Nov 27 1880

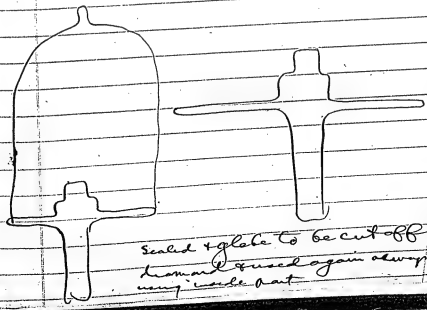


—November 1880—



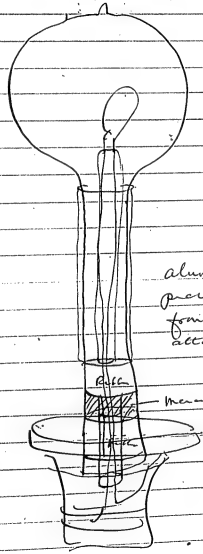
Decr 6 1880 T.A.E.





Sealed + globe to be cut off by diamond & used again always using inside part

Dec 18 1880



aluminum ferrule or cylinder prevent dissipation heat from the glass prevent it attacking Rubber

December 1880

~~THE~~ EDISON ELECTRIC LAMP ~~CO.~~

Thos. A. Edison,
Chas. Batchelor,
Francis R. Upton,
Edward H. Johnson.

Menlo Park, N. J., Dec. 16 1880

Fig. 1.

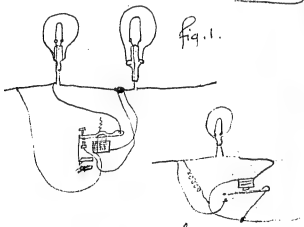
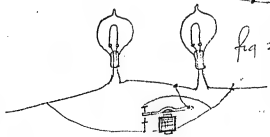


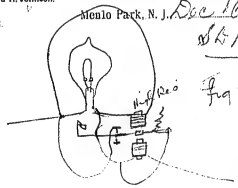
Fig 2

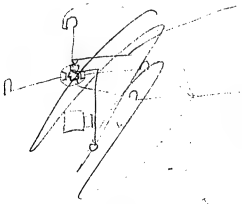


Thos. A. Edison,
Chas. Batchelor,
Francis R. Upton,
Edward H. Johnson.

Menlo Park, N. J. Dec 16, 1880

Fig 3



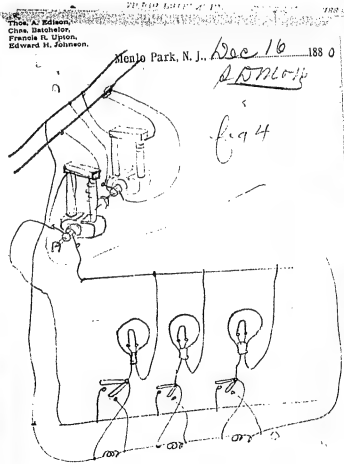


Thos. A. Edison,
Chas. Batchelor,
Francis R. Upton,
Edward H. Johnson.

Menlo Park, N. J., Dec 16 188 0

A. Dmlow

fig 4

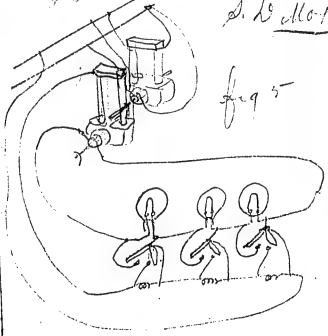


Thos. A. Edison,
Chas. Batchelor,
Francis R. Upton,
Edward H. Johnson.

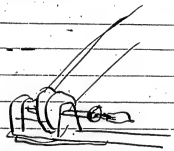
Menlo Park, N. J., Dec 16 188 0

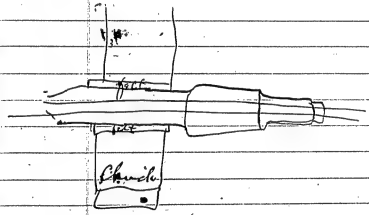
S. D. Mott

fig 5

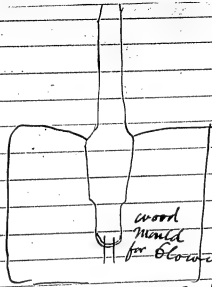


Dec 15 1880

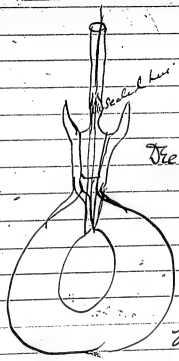




for opening glass stopper Vacuum Lamp


wood
mould
for blowing blank mould
or stopper part
for grinding
Stopper Vacuum part

Dec 15 1880



Dec 18 1880

P.E.

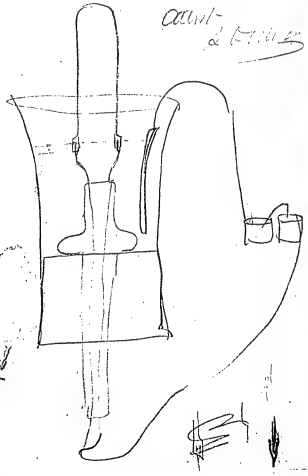
Medal Vase Stopper w/f
6 Lamps.

Hoop Dr. Dd

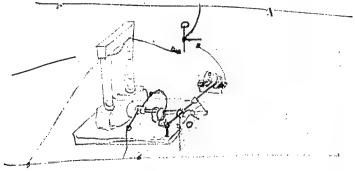
Palzovo

London

Patent. Dec 27 1880



Dec 4th 1860

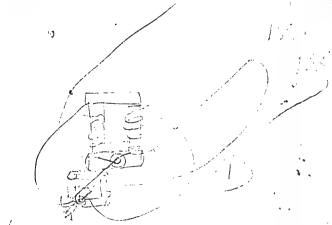


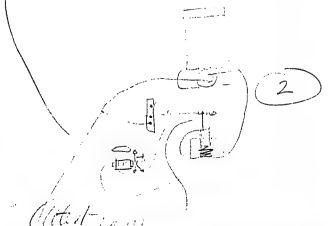
Mail
Patent

Ashton

T. A. EDISON.

Menlo Park, N. J., 1880.





Witness

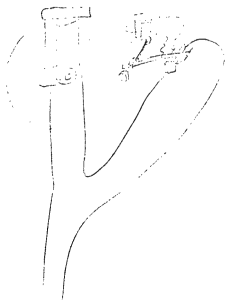
VIII 383

XII 1x

XXXI 1x

II 332

3

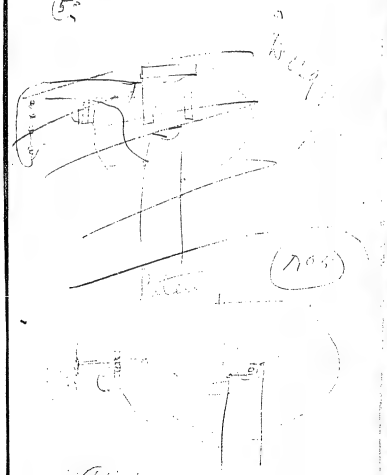


Attest

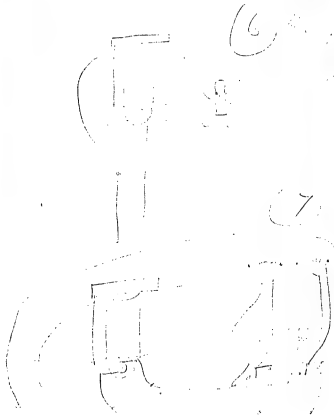
S.V.M

Menlo Park, N. J., 1880.

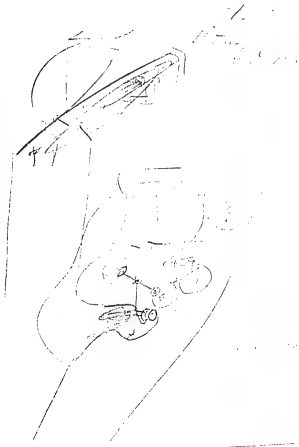
(5)



Menlo Park, N. J., 1880.



Menlo Park, N. J., *1880.*



Laboratory Notebook, Cat. 30,101

This notebook is by Charles Batchelor and covers the period July-August 1878. It contains notes and acoustic recordings from an investigation of noise on the Metropolitan Elevated Railroad, along with notes and drawings of the aurophone and megaphone. The notebook is similar in style to the thirteen soft-cover tablet notebooks that comprise Unbound Notebook, Vol. 3. The cover is labeled "Laboratory Notes Number 62 T.A. Edison, Menlo Park, N.J." It also contains an inscription, written by Batchelor: "Experiments to determine the cause of the noise on the Metropolitan Elevated Railroad." About 30 pages of this unnumbered book have been used.

LABORATORY NOTES.

Number 62

Experiments to determine the cause of the noise on the Metropolitan Elevated Railroad

T. A. EDISON,

Menlo Park, N. J.

Elevated railway noise

July 8th 1878

Chas Batchelor

~~In~~ 1 We find that every joint is made directly on the cross tie

2 We find that in riding inside the car there is there is more noise where there are upright side rails to the road and a great number of cross girders: –

3 We find that in most places when the cars go over, the rails sink about ¼ inch showing the rails to be lifted up by heat or otherwise.

4 We find that the lattice girders some of which are weighted in middle act as reeds and continue the vibration for a long time after the train has passed

5 We find that the part between Chambers St and Grand St is wide (very) with heavy spans far apart.

6 We find that the diagonal cross rods vibrate strongly

7 We find that nearly all the rails butt together leaving no room for expansion although that might be with the excessive heat today.

8 We find that trains run above (in attic) do not make as much noise perhaps it would be better to stop and start quicker thus run slower

9 We find that most of the noise is due to the hammering on the rail joints by the trucks.

Edison Chas Batchelor 10 hours each

Elevated Railway Noise July 5 1898

Passenger

10

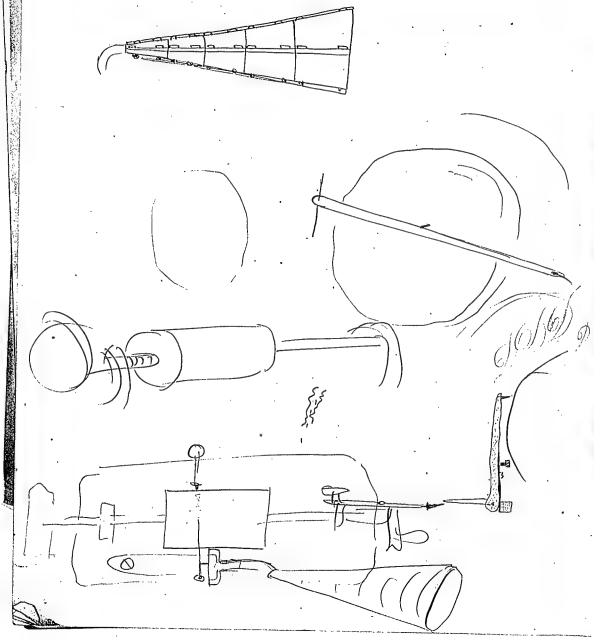
On the track we find that there is a sound produced by trucks on ends of rail
Also sound produced by wheel passing over every tie as it is much more solid on ties than between and the difference makes noise then again can also be noticed a thuck peculiar to the wheel passing over every cross beam these all help to make the roar

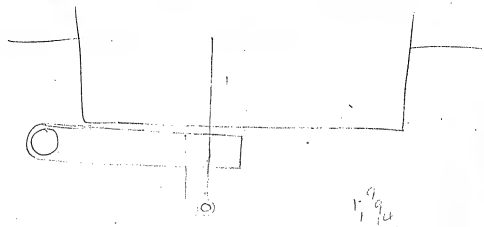
Edison + Batchelor # 10 hours each

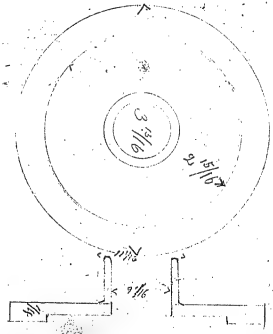
Megaphone

July 6th 1878

Clark Batchelor







Phonautograph for experiments on Elevated R.R.

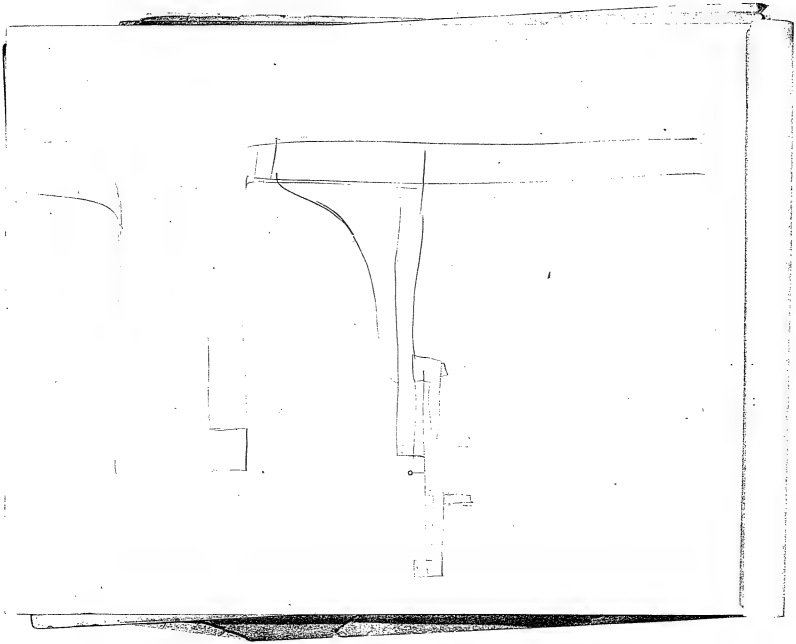
July 1st 1884

Chas Batchelor

Phonautograph for experiments on Elevated R.R.

July 1st 1878

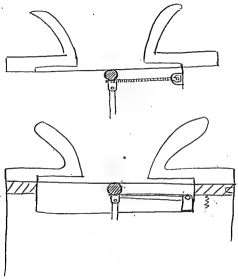
Chas Batchelor



Aerophone

July 7 1878

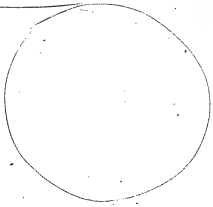
Chas Batchelor

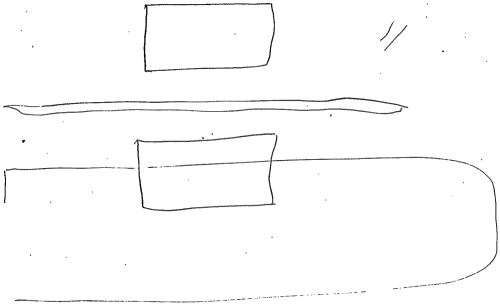


Mussi put a small lever on centres in this fastened to the rod by pin and shellaced to diaphragm with a piece of solid rubber between. You will have to put a ring of metal between the mouthpiece and the body of casting in order to raise diaphragm high enough.

You will have to make the lever pretty light

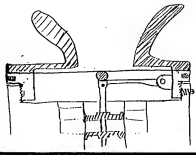
Can't be put together yet



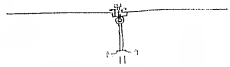


Cerophone

July 7 1878

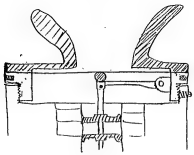


Chronometer

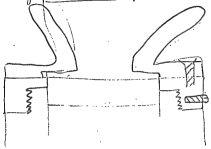


Earphone

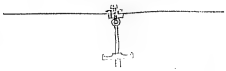
July 7 1878



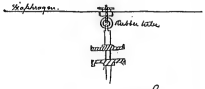
Adjustable ring



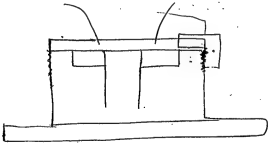
Charactector

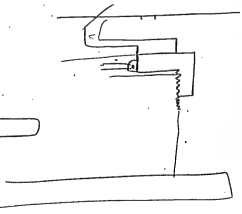


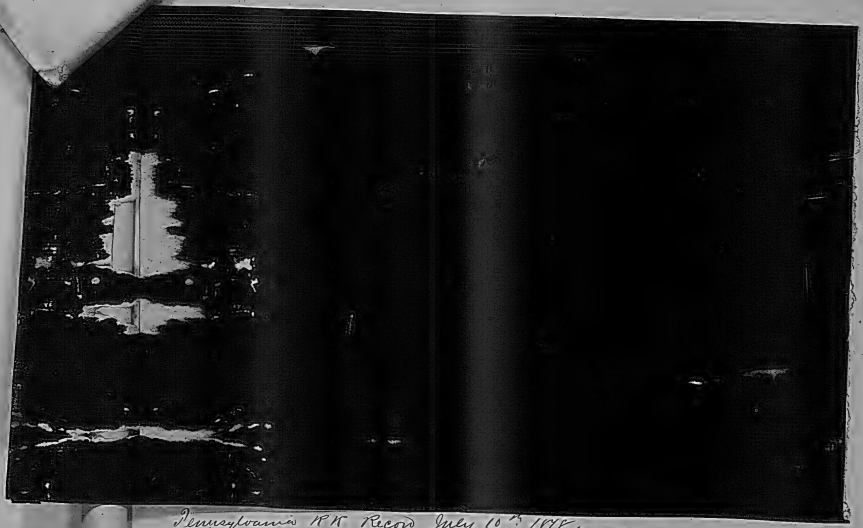
Diaphragm.



adjustment on diaphragm

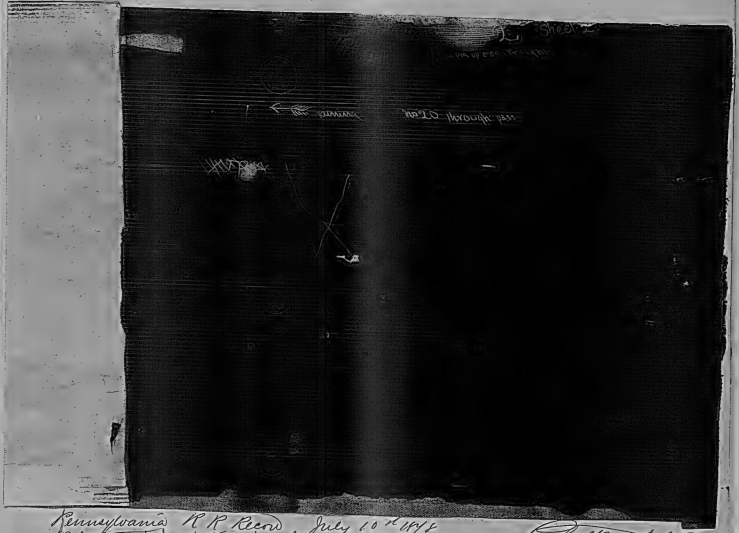






Pennsylvania RR Record July 10th 1878.

Chas Bachelder



Pennsylvania R R Record
of last must be attached up well July 10th 1891

Pennsylvania RR Record July 11. 1878

R. W. Patchell

Metropolitan Elevated R.R. Aug 14th 1895

Chas Batchelor

1 In taking records from window on 6th Ave I notice that the noise from a car that had curtains round the wheels and also one that a wooden box round the wheels was less than any other train but very little.

2 I notice that there is a roar caused by the wheels resounding in the hollow bottom of the car. the car bottom is a hollow box about 4 or 5 inches deep and when the train is stopping and starting it is plainly heard to resound to the noise of the wheels over the sleepers and ends of rails. when at full speed this seems to be a fine roar.

3 In taking records I notice on the train that if I am in the end of train I get a very poor record whereas if I am near engine I get very prominent waves therefore I think there is a great deal of noise due to the engine itself

4 Noticed also from window on 6 Ave that when Engine alone passed made a great deal of noise although it

give poor record owing to it going so slow

5 Tapping for exhaust is very difficult and when the train gets too great a speed we stop and take again when it slows down a little.

6 On Aug 19th in tapping for cross girders we had the machine out on end platform and ~~at~~ got very poor record although machine was sensitive I think it was due to being so far away from Engine.

7 Between Bleecker St Grand coming down is exceedingly hilly and they run very fast there sometimes.

Aug 20 1905

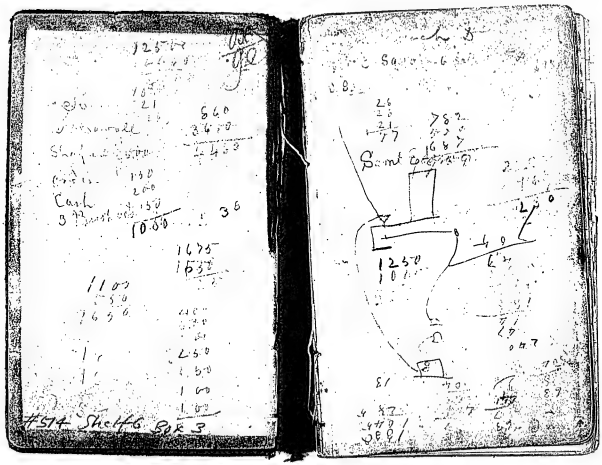
POCKET NOTEBOOKS

The thirteen books in this series consist primarily of notes and drawings about telegraph devices and batteries. They cover the period 1867-1875 and most of the entries are in the hand of Edison and Charles Batchelor. The first book was probably begun by Edison in 1867 and contains drawings of telegraph apparatus, geometric forms, and a list of books on telegraphy and electrical science. Some of the notebooks contain miscellaneous payroll records, accounts, inventories, and work orders. These are primarily by Batchelor but occasional entries were made by others in the Newark shops. Two of the books were used by Edison in 1873 when he went to England to demonstrate his automatic telegraph. They contain drawings of telegraph devices, notes on telegraphy in England, tests of the Greenwich cable, and street addresses of telegraph instrument makers. Many of the pages in the pocket notebooks are completely loose; the original order of the loose pages in the unnumbered books is sometimes unclear. The following books comprise this series:

PN-69-08-08	(1867-1871)
PN-70-10-03	(1870)
PN-73-00-00.1	(1873)
PN-73-00-00.2	(1873)
PN-74-00-00.1	(1873?)
PN-73-03-26	(1873)
PN-73-04-30.1	(1873?)
PN-73-04-30	(1873?)
PN-73-11-27	(1873)
PN-74-01-20	(1875?)
PN-72-00-00	(undated)
PN-75-00-00	(undated)
PN-75-01-01	(undated)

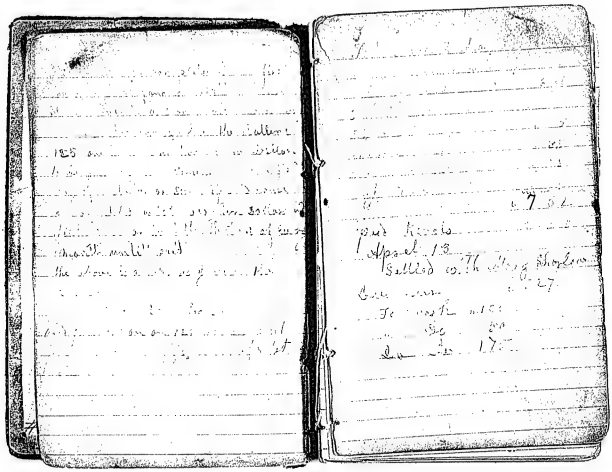
Pocket Notebook, PN-69-08-08

This notebook contains drawings and notes by Thomas Edison, probably from 1867, and personal accounts of Edison's father, Samuel, with one dated entry from August 1869 and other dated entries from January 1870 to June 1871. Almost all of the material by Thomas Edison is in ink and consists of 16 pages of drawings of telegraph apparatus or arrangements; two lists of books, mostly on telegraphy and electrical science; an unfinished table about relative electrical conductivities; and sketches of some simple geometric elements. The drawings include copies of telegraph repeater designs, some of Edison's own designs for repeaters, two duplex systems, and various relays. One book list and the geometric elements are widely separated by blank pages from the other material by Thomas Edison. The Samuel Edison accounts are in pencil and most of them appear in two groups, about 10 pages at the beginning of the book and about 20 pages at the end. The cover is marked "Memoranda." Approximately 60 pages of this unnumbered book have been used; about 30 pages have been removed from the book. Many of the pages are completely loose and their original order is unclear.


Cash
#54 Shelf 6 Box 3

Mrs Johnson for
[illegible] House [illegible] $1000
" 1 washing Machine — 60
" cash for Boots Boots — 200
Feb 25 cash — 60
" 27 cash — 40
1 plug Tobacco — 10
Lime — 50
Mar 1 To cash — 2[illegible]
15 [illegible]
15 [illegible]
28 Cash — 125
Jan 10 Cash on [illegible] — 50
13 Cash — [illegible]
1300

January The 8 1870
Samuel Edison
Bought of Mrs Colwell
The lot of Land the new one
Excepting one acre on the South
west Corner & Rodney Everton
Road running 21 Rods back
for $250.00 To the said for as follows
2 acre to field [illegible]
16 feet wide and 2 story
1½ Stories high The house [illegible]
[illegible] at [illegible] and [illegible]
[illegible] and [illegible]
1 Bedroom and Parlour to [illegible]
and Stock to [illegible]
Alone Side and South [illegible]
[illegible] and the Ends [illegible]
other Side The house to be [illegible]
with the usual [illegible]
Kilsman of earth [illegible] costing [illegible]
for [illegible]



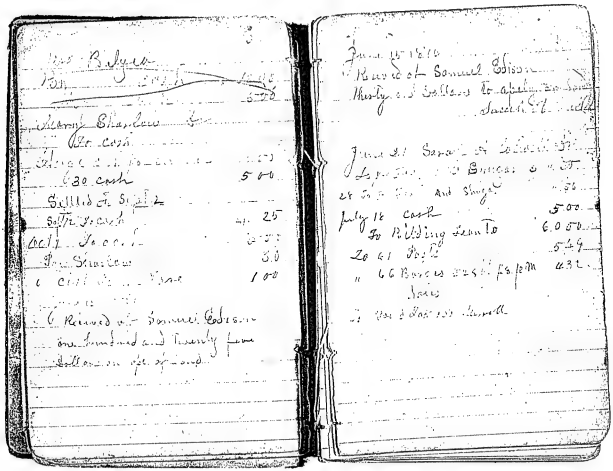
April 12 1870

Mary Sharlow

June 10 Pay Cash

June 10 1870 Mary Sharlow

Cash



Received of Samuel Ellison
One hundred and Twenty four
dollars on acc. of land

Bill of Lumber to St. Mary's Church

Roofing	618 00
34 [illegible]	3 50
250 [illegible]	9 50
10 Rafters	1 75
15 [illegible]	75
2 [illegible]	2 00
2 [illegible]	1 50
3 [illegible]	5 00
1 door	75
150 ft 2½ in Siding	
2 [illegible]	5 00
11 Shingles	
55 ft of Lumber for [illegible]	50
[illegible]	1 00
Carpenter Work	8 00
	61 35

Coll [illegible] Section

Stone Sand

North 20 South 10 [illegible]

[illegible] 42 135

North 37 [illegible] 10 feet 4 inches

August [illegible]

[illegible] Lumber 250

[illegible] Cash 200

Bolton [illegible] 400

[illegible] Carting 200

[illegible] 1 20

[illegible] Cook Dr

[illegible]	6 40	5 [illegible]
Cash	100	
22 Cash R	900	
[illegible]	250	

Billed up to Oct 2 1877

Oct 1 [illegible]

Marine Shipping [illegible]

To cash [illegible]

[illegible]

[illegible] 0 50

[illegible] 1 00

To Cash 1 00

November 1 [illegible]

[illegible] 6 00

[illegible] 5 [illegible]

[illegible] 2 [illegible]

Cash for [illegible] 2 50

[illegible] 2 50

Cash for [illegible] 1 50

Cash at [illegible] 1 25

Cotton 1 20

Cotton 40

George Enoch
Commenced work Feb 10 1870
Cost £ 2121

Further list of Wright's Books

Faraday's Researches in Electricity 1 Vol

Gn Free Library

Electric Telegraph by Dr Lardner

Entirely Re-written by Edward B Bright

F, R, A, S, Secy. to the British & Irish

Telegraph Co 140 Illustrations 8vo — 5s

— 1867 —

Handbook of Electricity Magnetism and

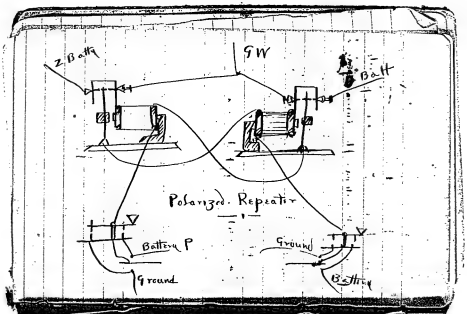
acoustics by Lardner Edited & completed

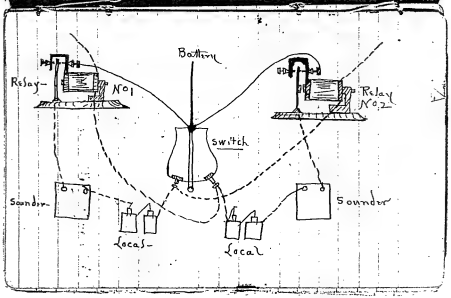
by G C Foster B.A., Prof of

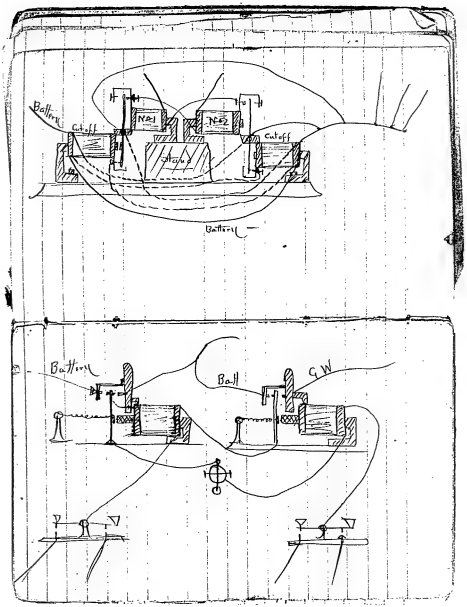
Experimental Physics University College

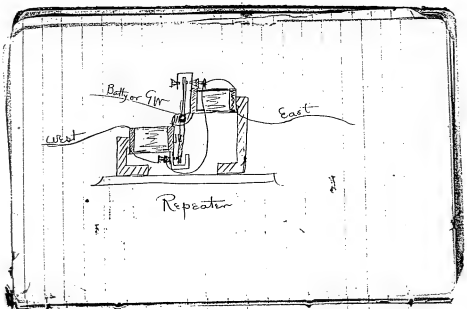
London New Edition Small 8vo 400

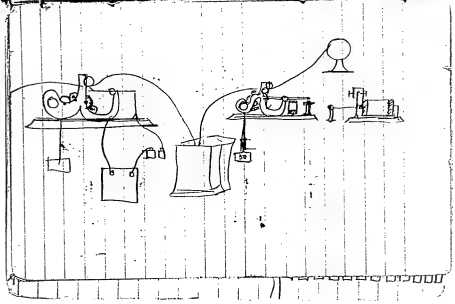
Illustrations Price 1867 — 5s

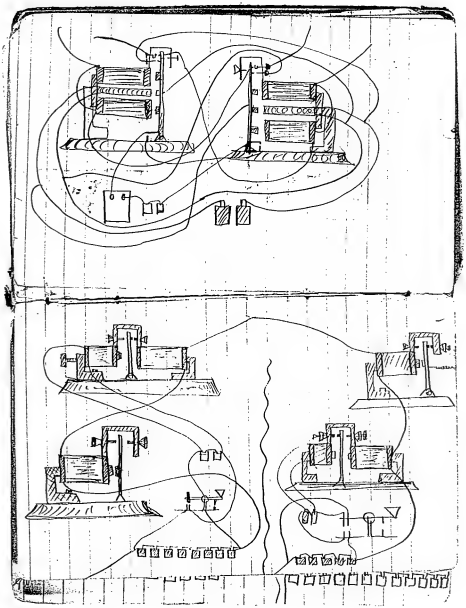

2 Batts
SW
Batt
Polarized Repeater
Battery P
Ground
Ground
Battery

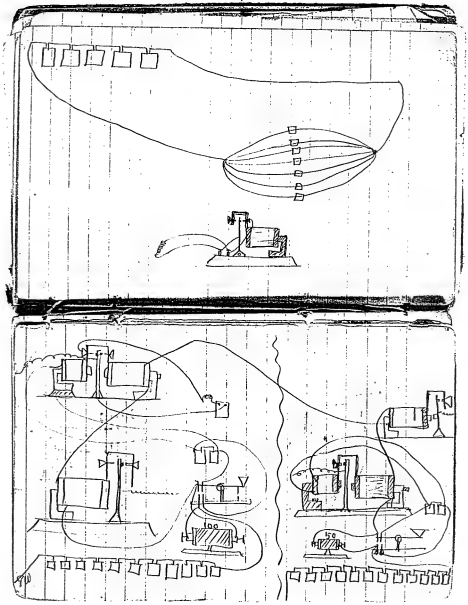

Battery
Relay No 1
Relay No 2
Switch
Sounder
Sounder
Locals
Locals

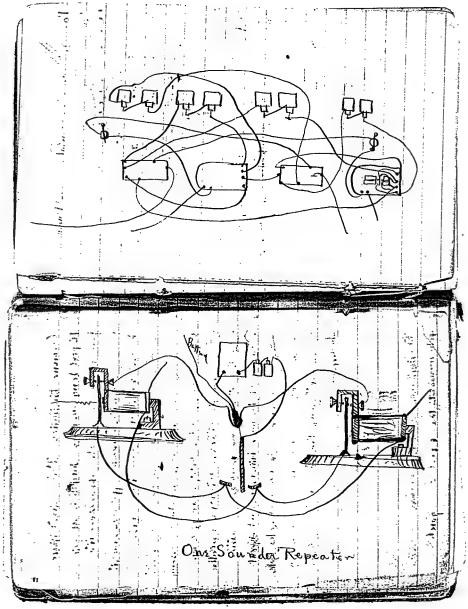

Battery
Cut off
No 1
No 2
Cut off
Battery
Battery
Ball
C.W

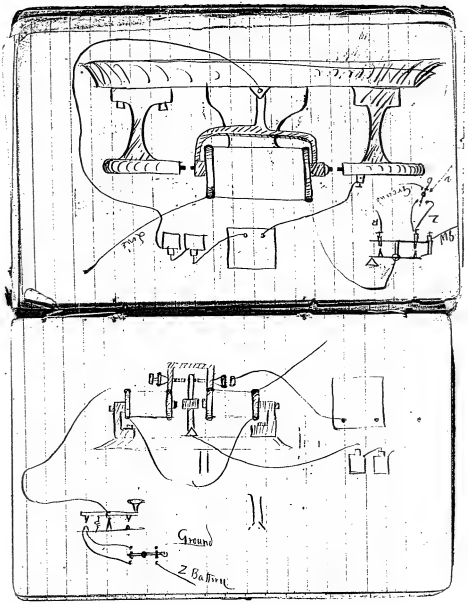

Battery Cir
East
West
Repeater






100
75


Omni Sounder Repeater

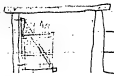

Ground
Z Battery

Conductivity of Metals

Proceds Royal Society -

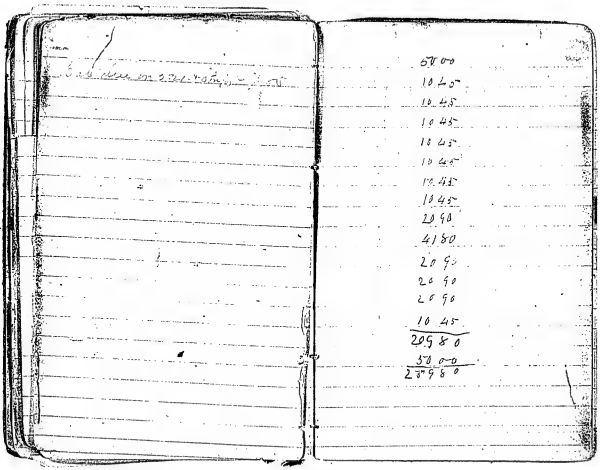
	Conductivity Silver = 100		Silver = 100 Expansion	Condty at 212°	
	32°	212°			
Silver (hard drawn)	100.00	71.96	100.00		
Copper "	99.95	70.27	96.20		

— No 900 —



January 1[illegible]

Due Edison	$114.60
In Rent	69.00
	3 / 150
Bill for Stamps	1.80
Paper & Clips	1.6[illegible]
Nothing	[illegible]
Cash	19.

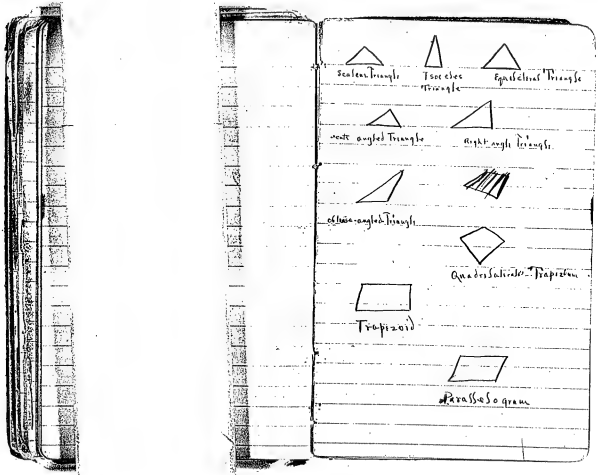


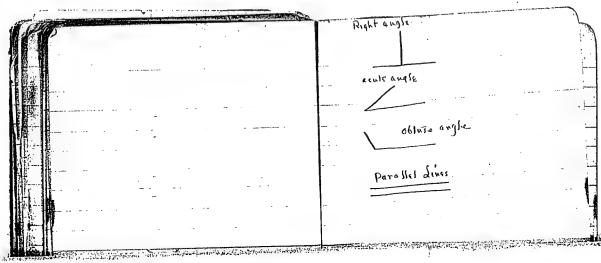
58 00
10 45
10 45
10 45
10 45
10 45
10 45
10 45
20 90
41 80
20 90
20 90
20 90
10 45
209 80
58 00
267 80

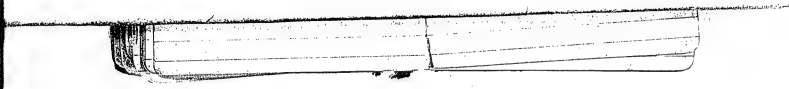
— Books —

Culleys - Practical Telegraphy - London
Walkers — Electric Telegraph Manipulator "
Dr C.C. Bombaugh - The Gleanings
III Edition Larger, pub - Kurtz of Baltz 580
pages - Curiosities Literature puzzles
antigenbated Cyphers 175 - Refer R. Table
Page 333 —
Sabine on Electric Telegraph pub - London 1867
price 6 dollars - Van Nostrand N.Y. —

Vol. 1


Scalen Triangle
Isosceles Triangle
Equilateral Triangle
acute angled Triangle
Right angle Triangle
obtuse-angled Triangle
Quadrilateral Trapezium
Trapezoid
Parallelogram


Right angle
acute angle
obtuse angle
Parallel lines



Disbursements

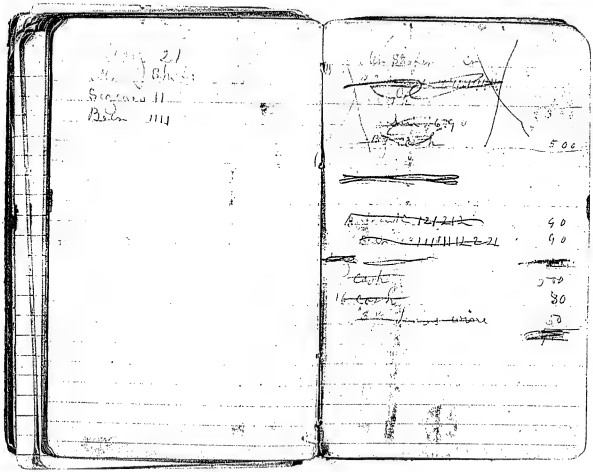
1 Pr. Brands	$ 90
Brewer	" 90
Cash	$ 50
Cash [illegible]	50
3 Pr Brands [illegible]	" 3
	$ 11

May the 4th 1871

Mary Chapman Dr

To cash	$25
6 " Cash	1 25
12 r 1 Pair Boots	3 75
15 cash for Supplies	75
20 cash [illegible]	[illegible]
[illegible]	" 12
[illegible]	" 50
24 " [illegible]	$ 50
June 8 Cash [illegible]	$ 60
	$15 37
	" 1 00

4



Mr Cooper

To Rent 50.00

By cash 5.00

" do 6.00

" do 5.00

By Sistrum 15.00

" work Fujes

April 27 5.00

May 11 5.00

Bill of Lumber

Mr. Shar 24 10 ft

12 Rib 24 10 length

Lumber 2 x 6 16 ft board

75-

6

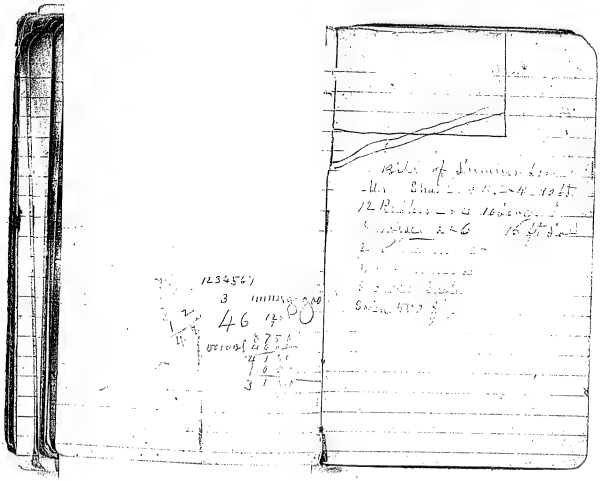
4

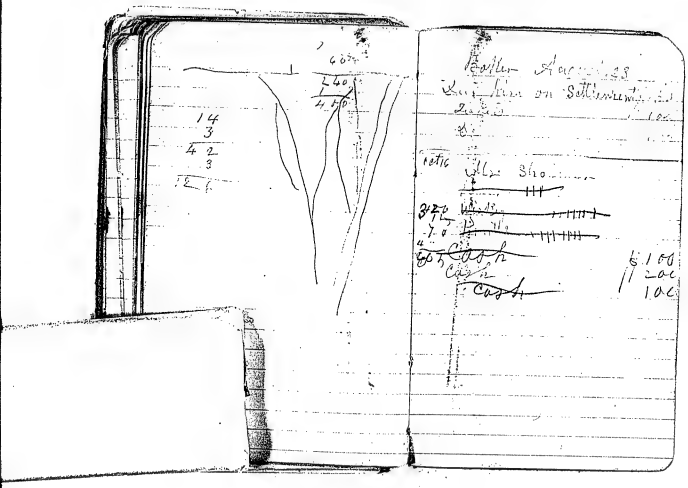
Mund on ellis 9

6

6

8





Aug 12 70

Aug 12 1876

Mr. P. Olson

Will you give us the half of the [illegible] would you [illegible] let me have the South half and we give you our [illegible] and [illegible] you would [illegible]

Sell the [illegible] give [illegible]

Sel [illegible]

Aug 25 1876

2 lbs Steak .30

2 lbs do .30

9½ lbs Mutton $1.15

Beef + mutton .40

Beans .50

Cash $1.00

Charles Foster No 29 W.
4 Street west of Broadway
New York

Mr. Foster Cr
To 4 Lots Land @ 600
To 1 Brick Dwelling Hous
To [illegible]
To [illegible]
To 1 Brick Dwelling [illegible]
To 1 Gas Fixture [illegible]

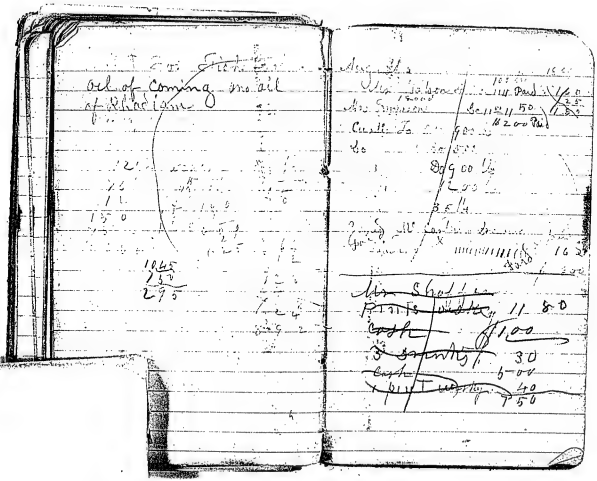
Cash [illegible]
4 [illegible]
4 [illegible]
4 [illegible]
4 [illegible]
1200
1200
1700
1300
1300
2900

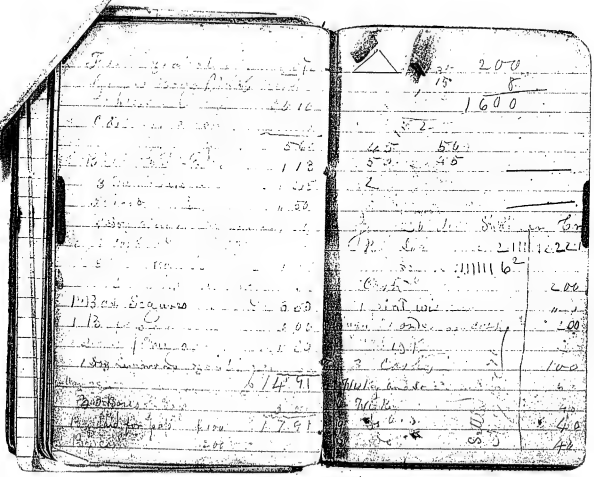
Burning

Mr. Shalow Dr.
Bought of M. Newell, 18.00
To cash on Edwin
Meal 4.50
Meat on Edwin 1.00
order on Clop .50
6.50
order 6.00

Jan 15 Shalow Cr
By Sugar 10 lb 1.50
0 Shalow
Meat 2 lb smoked
3 Cash 1.00

Mr. Shalow Dr.
To Pasture .15
1 Bowl .10
Cups 1.50
1 Bowl large .20
1 Pail with .20
1890 T 5.5
80 .25
147 lb
16 Cash 5.0
cash 3.01





Silas M. Bradshaw
Bridge Carners
Saline Co.

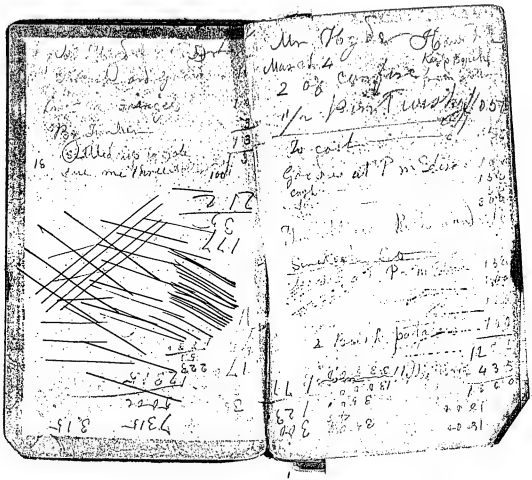
42 12 100

365
40
14600

1250 25
3100 154
1800 76
17400

146 Days at 100

365
202
563



Pocket Notebook, PN-70-10-03, Cat. 1179

This notebook consists of twenty-eight unbound and laminated leaves, which have been numbered by an archivist. The entries are in Edison's hand. The first several leaves contain lists of machines, tools, office furniture and supplies, and accounts of personal and business expenses. There is also a one-page agreement of October 29, 1870 between Edison and Samuel W. Ropes, Jr. The latter part of the book contains descriptions and drawings of printing telegraph and other apparatus "Drawn at L Serrells office" on October 3, 1870 and a drawing of a chemical pen dated Oct. 10, 1870. The inside back cover bears the inscription "all new inventions I will here after keep a full record."

Blank pages not filmed: 11, 14, 16.

[illegible]	[illegible]
[illegible]	93.00
[illegible] Barrel	10.75
[illegible]	11.11
[illegible]	4.[illegible]
[illegible]	[illegible]
[illegible]	20.00
[illegible]	6.00
[illegible]	26.00
	223.90

[illegible]

[illegible]	[illegible]
[illegible]	72.[illegible]
[illegible]	14.70
[illegible]	15.00
[illegible]	3.60
[illegible]	4.00
[illegible]	9.94
	[illegible]

PN 70-10-03

E-6577-1

cat. 1179

Sheets numbered in circle on lower right corner by N.R.S. 6/3/68 before laminating

1 Die sinking Machine	495 00
1 Shaper	550 00
2 Engine Lathe - large & small	270 00
	360 00
~~1 Shaper, large lathe~~	
~~3 Northern Small Lathes~~	
2 Screw machines	800 00
~~1 Rotary Lapper~~	
~~1 Jig Arbor~~	
1 Large Power wire machine	
~~1 Small~~	?
~~1 Good Large Turning & Boring~~	
~~1 Small Silk Cards~~	
~~Silk Spinners~~	
1-0 ~~Silk Twisters~~	
~~1 Small Silk Lathe~~	
2 Vises - at 5.75	11.50
1 Hull Pen - 4 Spindles	360.00
~~1 Steam Shears~~	
~~1 Slow & Jigger Burners~~	

(2)

1 Brown & S. Milling Machine
1 Screw plates
1 Bench drill Stand
1/2 Hand vises
2 Cutting Nippers
4 Pattern Files
4 Small Lathe matrels
20 Pair Dividers
6 Mortisers & Chisels
6 Hammers
24 Rules & squares
24 Gauges
2 Calipers
2 Hand Jointers
3 Calipers rules
1 Standard Files
2 Drill & Reamer vises
2 Pipe Plates
2 Center Hammers
2 Doz Assorted small hammers

2 Bunsens Burners
1 Pair small metal shears
1 Rasp
1 Complete set of carpenter & Model makers Tools or Patterns
2 Complete set Twist Drills
2 Crow Bars
1 Pair pliers
2 Soldering irons small & large
1 Steel Rules
4 Wood planes set in frame
2 Metal Saws
1 Steam circular metal saw
4 Screwdrivers
3 Stock & Dies
5 Mallets
2 Lead hammers
1 Carpenter Rule
1 Tape line

1 Microscope
1 Eye glass
3 Lacquer Brushes
1 Relert Stand
4 Oil Cans large
1 Large Stove
35 Paper Curtains
1 ~~Name [illegible] Clock~~
~~3 Set figures~~
3 " Letters
1 Twist Drill gauge
~~35 Oil cans~~
~~6 Pan [illegible]~~
~~45 Buckets~~
~~2 Cuders~~
2 Brooms
3 Pails
1 Sink & water
Gas Pipe & 35 Burners
~~14 Cocks~~
~~3 Bling Pipes~~

1 Office Desk
1 Set Books
22 Set files
1/2 Ton assorted steel & iron
46 feet pattern wood
~~6 Boxes~~
140 feet benching
3 Partitions
Shelving for office supply and
Tool room
26 Stools
3 Arm chairs
1 Welding rack
3 Large wet Bottles
5 lbs Solder
Belting
Hangers Shafting & Pulleys
3 Door Locks
40 Burners
2 Surface Plates
1 Horizontal for [illegible]

1 set assorte files
1 looking glass
2 Dividers
1 Gallon Alcohol
1 Gallon fine oil
5 gallons shaft lubricating oil
1 " Lathe oil
1C ~~Polishing powder per pound 12 9 0~~
assorted emery wheel
2 Tablets per do
1 ~~Coffee Pot~~
1 Soldering acid Bottle
1 Hatchet
50 feet rubber tubing
2 gas stoves

~~Pure~~
~~1 Hatchet~~
~~Screwdrivers~~
~~4 Chisels & gouges~~
~~4 Shovels~~
1 Cast Pan
~~3 Brass Pipes~~

Compt for office
Paper " "
2 Ink Bottles
1 Bottle 2 gals ink
1000 Bill heads
1000 Cards
~~1~~ Box Envelopes
1 Rear winding paper
~~1 Drawing Tools~~
~~1 Tool Bottle Stand~~
3 Tumblers
1 Pitcher
~~1 Tumbler~~
~~Bottle ink 1 gal~~
~~Machine Screws~~
3 Bottles Spring brass wire
~~Milling Tools~~
~~1 Hatchet~~
1 Clock
~~1 Sprinkler~~

1 Charcoal 13 x
1 Gas burning Pipe
3 lbs Pumice stone
6 Cans 10 lbs each (assorted) emery
~~100 sheets assorted Emery paper~~
6 doz Sand Paper
3 lb glue
1 lb Prussiate Potash
3 lbs Soda
2 lbs fine unbleached Lacquer
3 Lacquer Strainers
20 Sheet filler paper
3 funnels
1 Screw Case for standards
1 Scissors
~~1 Jumper Anvil~~
1 Anvil block
~~1 Jumper for Saws~~
1 Swivel Bolt
~~1 Planer Square~~
~~1 Depth Gauge~~

~~Hand Drill~~
~~Sulpher Sponge~~
~~1 Common Drill Press~~
~~1 Inter Milling Machine~~
Anvil Block
~~Stake~~

Belden New Haven

14 Inch swing G Lathe	300 00
Planer 24 inch Sqr	550 00
Screw M	400 00
	1250 00
Charges	1100 50
	$1100 00

Shaw & Ellis Hammer
Smallest size 300 00

E. Hyde Dr. To Thomas Edison

Oct 6	Cash	20.00
17	Cash	40.00
20	Cash	20.00

T. A. Edison Dr. To E. Hyde

Oct 3	Cash	31.00
Oct 5	Cash	[illegible]

Oct

Fare for self & Hyde		
Hotel Cost	42	00
Freight	8	35
Hyde	20	00
		50
Fares	8	50
Microscope	2	00
Tickets & fare		
Pattern for Pencil Sig	10	00
Expressage		25
Note		64
Tickets to the fair	1	00
Fare - Shut fare		30
Expressage Lines	1	40
Paid Dutton Company	50	00
" Hyde	50	00
Pitt Composition		
~~Number 3 O.G.~~	~~40~~	~~00~~
Tin smith	11	30
Fare & Ticket for fair	1	06
Candles		25
Soda		65

Freight	4	99
do	7	50
do	7	20
Oils etc on acct	20	00
Wood Screws		50
Gave Jensen	2	00
Paid Man	11	25
Other Man	10	00
Exonnage		75
Paid Jensen	13	60
Markwort	5	00
Hyde	30	00
Fowler	400	00
Denton	150	00
E		30
Carpet & Matting	8	10
Paid to men a for files	309	87
Paid Hyde	50	00

Private acct

Gave Unger on Anniversarical Pty	25	00
paid Oflaman on Anniversal to 5th	6	00

Newark Oct 29 1840

In consideration of the sum of one dollar the receipt of which is hereby acknowledged I promise to pay to T A Edison his heirs or legal representatives One twelfth $\frac{1}{12}$ undivided ~~interest~~ of all profits arising directly or indirectly from My Counsel in and relation and introduction of instruments ete with the Gold Block Telegraph Co of N York for a period of ten 10 years from date after ~~paying~~ receiving from them full payment of ~~my~~ dollars by me on my own promise which is $3,550

S. H. Ashton

(10)

List of Tools to be purch

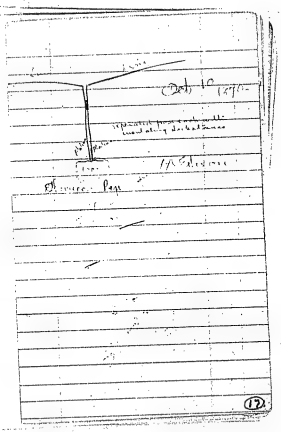
1	Forge & Blower	
1	Anvil & Block	
1	Large Back Gear & Punches	
	Iron Plates	
1	60z Taper reamers	
1	Rasp	
	Set Carpenters Tools	
1	Brass Plate	
2	Soldering irons Large & Small	
1	Bench Bolster	
	Stock & Dies	
6	Mallets	
1	[illegible]	
	[illegible]	
3	Hammers Finishing	
	Robert Steel	
4	Large Oil Cans	
35	Paper Cartridges	
35	Oil Cans	
2	Grinders	

1 Brooms
3 Pails
1 Sink & Water Pipe
15 Dogs
1 ~~Office Book~~
1 Tool Room Book
1 ~~Set Books~~

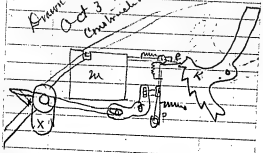
Lent Wann	25 00
Ropes	14 00
Emmet	5 00
Englishman	5 00

Total amount spent $6,244.65
" for Men 3,010.55
7 Oct 5 — 1876
Leaving $3,231.13 on Tools

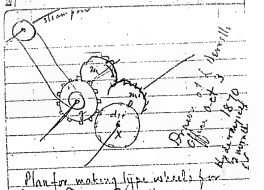
The union that Edleuck
put on the first Model
of Pope & Edison



From A. L. Sewell's office
Oct 3 1870
Continued 2 months before.

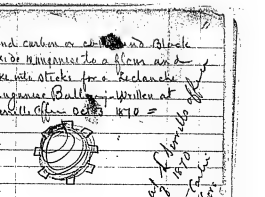


Machine for perforating paper for telegraphic purposes. m is punch which is thrown upon its end so that it will shear the paper like shears instead of pressing out X is paper drawn ~~by a pinion which draws the whole up by the forward & backward motion of the upright~~ P. e is a knife edge fixed in such manner that it will move down but not upward. K is a key provided with cam teeth of any number or required shape. When the key K is depressed it gives a number of teeth upward motion to the punch & paper drawing apparatus which produces a hole.



Plan for making type wheels for Printing Telegraphs & other purposes.
g is the wheel driven and rotates at a great velocity by steam X is a hardened steel die. M M' & M'' are grooved wheels which mesh into each other and keep the speed of g & X equal now by pushing slowly the die wheel against the wheel g when in motion the die wheel comes in contact & leaves impressions on thick paper like letters upon the edge of the tooth on wheel g etc

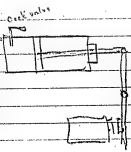
Grind carbon or [illegible] and Black Oxide of Manganese to a flour and make into sticks for a Leclanche Manganese Battery. Written at E. Orange N.J. Oct 1870 =



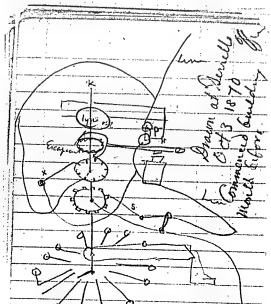
Rotating Battery to prevent polarization of the electrodes. The two elements are partially ~~the skeleton~~ then propelled revolving on a trough containing the exciting fluid which can of course be replaced by a porous plate. The shaft can be of great length & contain any desired number of elements, and be revolved upon supporting rollers or at intervals

(19)

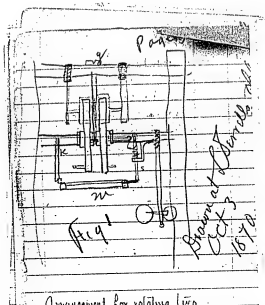
Brought down Oct 3 1870
Made 1 March 1870



To produce a adjustable slow motion by means of a guitar worked by a magnet or other power acting on a cylinder in an chamber and a cock valve. The cock being regulated and the power applied to the piston it goes forward as fast as the air can pass through the cock which can be so regulated that an infinitely small amount passes out or a large amount which takes have a gives a stroke motion to the guitar



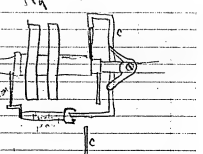
The shaft it has 4 wheels upon it the first is a type wheel the second the escapement wheel the third a brass wheel with thin insulated plates upon its periphery upon which the springs X rides has wheel is so connected with the primary magnet I that when the shaft has been stopped in continuous closure of the circuit the spring X is upon one of the magnetic wheels which allows the current to flow but when the wheel is rotated magnet I grows but when the wheel is rotated quite rapidly the spring X bears on the insulated both the same portion of the wheel for to 10 times as much as the brass plate & with the current is so too short a duration to affect the primary magnet. The 4 wheel is a break wheel having a spring & rubbing upon the teeth upon its periphery. The wheel having is connected directly with the key and by the motion of the escapement it is made to make a break in circuit of the magnet which gives it motion consequently it motion slowly. Electricity upon beam passes as the power. Dial Telegraph of Krumme illustrated & described by Latimer Clark — upon the end of the shaft is a dial wheel is rigid & revolves with the shaft around its path of a number of keys which when depressed stop the shaft in its rotation positions etc.



Arrangement for rotating two type wheels upon one shaft by one escapement & one ratchet so that one type wheel can be rotated while the other is locked & vice versa. This is done by a key movable lock on the shaft of the type wheel

which is moved back by being commed by the commed detent g and commed forward by the upward movement of the pipe beam m com fock e when the shaft is in a certain position. One of the type wheels will be always carried around except when the operator brings the wheel into a given position then by an upward movement of the printing beam the type wheel has been locked to the shaft & carried around but will be commed back by g unless he raises the printing beam again etc & the instant approaches for bringing the shaft at any revolution at a given point rotating by the printing beam the

Fig 19 Page 4



Same principle as in Fig 1 Page 3

Tinned Double Polarized Relay

Drawn at Lincoln Fig 1 Pg 3

Constructed 13 to 3 years before

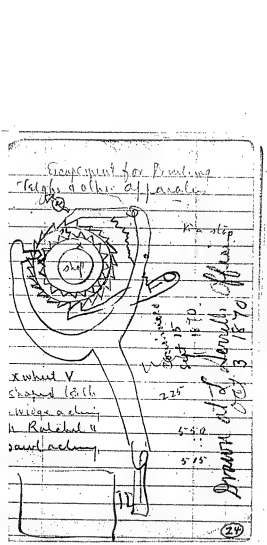
Polarized Magnet with two tongues but with but one pair of magnets these tongues are both pivoted in the back of the magnet and by giving them or pulling them closer to one side of the other one tongue will work on a positive current to the exclusion of the other tongue but from the current is intermittent like a common Relay and vice versa

When a negative is sent in unit with the other tongue on this can be arranged between the forks of the magnets that this will only change when the current is changing but not when it is steady

Ames:

Die Sinker & Vise	55.00
4 Spol Drill Press	360
5 foot Eng L 13"	400
7 in swing Lathe & Table	300
	1610.00
	161.50
	~~1771.50~~
Michigan Tacing Sold	$1,449.50

Equipment for Finishing
Ralphs clothing apparatus

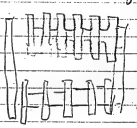


Pendulum Magnet

Means of working two magnets upon one wire

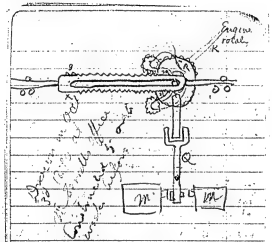
S is a polarized Magnet
if tongue is centered equilibrium
between the pending & both stamps
are in — When say a potential of
negative Electricity is sent through the
tongue of relay S is attracted to point of
shade, spring is then put back
[illegible] when mag S [illegible]
[illegible]

Electro Magnet



Constructed with washers
in form or turned out
of solid stiff & placed in
[illegible] the wire
by means of these slots in the
Cross cut [illegible] wound from

one end of the Electro Magnet
Brother [illegible] all in [illegible] to wire
[illegible] with the [illegible]



Mechanical Movement To
To transmit a continuous rotary
Motion into a back and forward
motion quick long which
shall stop itself at each of
the point between which it
plays This is done by
having teeth at y & none at
x & teeth at z & none at

flange which has a milled
projection by the side of the
shaft so a arm with a spring
upon the shaft upon the ends of
these arms are clicks movable
which rub along the milled
flanges now if the wheel goes
forward the click engages
in the milled teeth and
the gear wheel is locked to
the shaft which is then
rotated but the other wheel
goes in opposite direction is
not locked now when a
back motion of the wheel
occurs the other wheel
locks & carries shaft forward
in same direction =

Approaching for Punching out The Figures for the amount of a Check etc. x is shaft with 1/2 to 3/4 diameter having 10 to 20 Ribs cut in it lengthwise Fastened in the form of a Lock m is a [illegible] of a plate. This plate guides keys with Racks upon them the teeth of the Racks engaging in gearing [illegible] with the rules

m x = f & f' are two wheels containing letters in relief the other such in. They act like a punch. In paper you Column then to be punched. shaft x has a binding bearing

Any number of keys can be used on the key after the rack is a gain to press the wheel of double without of punch.

(27)

Shaper	550.00
Emery Grinding Ma 3 wheels	129.00
20 Vises at 5.75	115.00
2 Screw Mac	808.50
7 in Lath	
13 in Lathe	
4 Drill Spindle Press	1449.00
Die Sinker	

3051.50

all new machinery

I will have lighter keep

refill work

28

Pocket Notebook, PN-73-00-00.1

This undated notebook contains drawings and notes made by Edison during his trip to England in the spring of 1873 to demonstrate the automatic telegraph. There are notes on the Greenwich cable tests and on telegraphy from London to Liverpool. Approximately 90 pages of this unnumbered book have been used. Several leaves have been torn out.

750
$13\frac{1}{2}$

2250
750

375

10125

9750
375

10125

10125
1800

11925

300

2000
6

12000

2000
3

6000

500
1

13
500

6500

Patrick
Liverpool
Polt. Tome
Johnsone

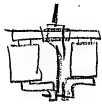
Telegraph (1873)

Arrange one or more
Condensers connected to
Earth with delicate
revolving armature
Engine having high
resistance spools so that
the Condrs will be
discharged ~~from~~ through
the engine & give a
constant rotation

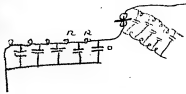
Small magneto - no perm
Gramme Compound ~~Int~~
prin applied well wires
so seperate in a rack
Coal Chpr than Zinc

ascertain if some magnetic arrangement could be made to attach to every knot or 10 K of a cable which should counter equal the electrostatic capacity of that number of knots, if they are constant. & increase & decrease with each other in the same proptn

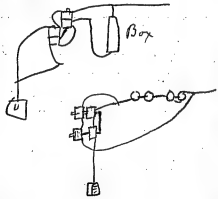
Disks. Vulcanite faced $\frac{1}{8}$ circle zinc other $\frac{1}{8}$ — $\frac{1}{8}$. C. each equal to zinc. revolve rapidly very close together, Connect C with one side galv paper Z with other hung. get indication



13
600
7800
300
8.100



or with magnetic ✓
might be wound
double thus



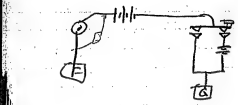
Resistance pretty dry
1 Cup through
Mirror Galvanometer
500 000 ohm
with 3 Cells 100 000
showing proportionate
to Cells applied

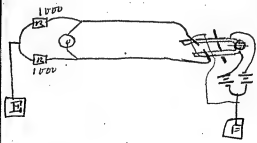
Thomsons Gal will give
quite deflection
through 4 millions
ohms
Mine gives data
in 10 seconds through

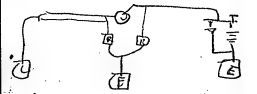
1 millions ohms
~~1 Cup 4~~ & Mirror
& ~~of~~ own R of
500 000

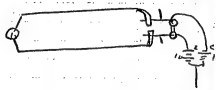
With 5 Cups give
mark right along

hence to make
paper very sensitive
on high resistance
circuits add at
required enough Cups
to just make a scarcely
perceptable mark
work upon the bally
at other end this

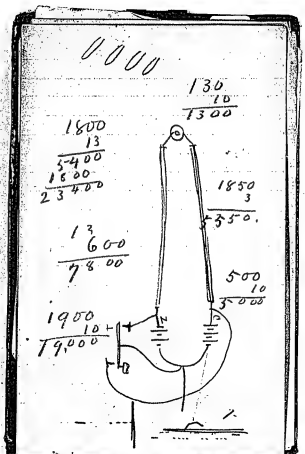


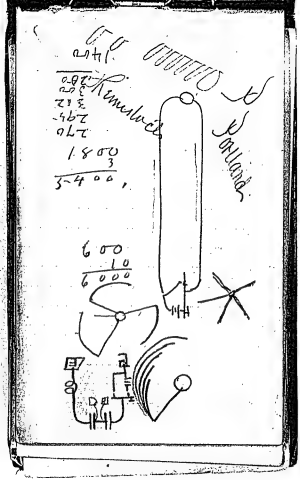




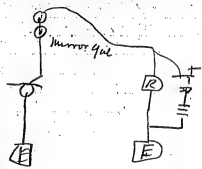


700 miles cable


130
10
1300
1800
13
5400
1800
23400
1850
3
5550.
13
600
7800
500
10
5000
1900
10
19000


1800
3
5400.
600
10
6000

1 600 ohm



Not working at 20 words per minute but could see that if higher there would be
Especially if the Current or Resistance for the charging was increased

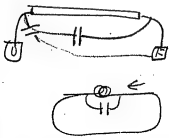
Tester says 1200 ohm McGrors used for receiving instr. 600 R

The internal resistance of 300 those Gutta percha batteries is 37000 ohm or $123\frac{1}{3}$ ohms per cell ok good

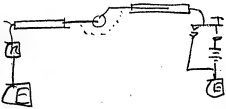
Length sections were

Sect.	Length	
1 + 7.	154.644	142
2 + 3	187.071	394
5	130.662	546
6 + 7.	140,596.	748

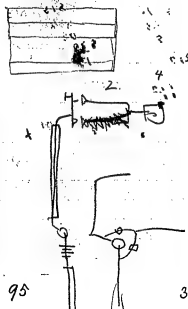
Tester says he 4 W.y South
watched Earth Currents
all one night at Valentia
Changed from P to N
Sometimes ½ minute
the other 15 minutes
he measured potential
one time was 50
Cells.



154



Joints near heat or
well as regular
Cors impossible
make perfect joint
Wetchel says
guess that's reason
wont allow more
battery or Chemical
action.



95 31.

6/190 sheets.

.18 / 108 — 20 / 12 — 24 / 6 .04 — 30 / 180

5/32. 60. 61 / 95. / 305 / 549 / 579.5

5 / 8951 / 2/01 / 130

60 feet 1/16 Cop drawn to 1 sqr foot of Tufool

61 feet 1/16 Copper wire

61. 2.00 / 5200

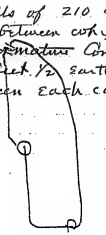
61 / 2.00 / 122.00

61 / 95 / 305 / 549 / 579.5

61 ow 305 / 8488 / 5185

61 / 92 / 122 / 549 / 732

~~to~~ real cable. ~~1½ time~~
60 coils ~~70 ohms~~ each,
between ~~each~~ coil, a
Condenser
Greenwich Cable 1000 miles
60. coils of 210 ohms
Each between coil & place
544 ~~armature~~ Condenser
square feet. ½ earth ½ line,
between each coil



18 miles on each

34
16
204
544

13 544 13
10 16
136 64
13
793.

13
16
78
13
26

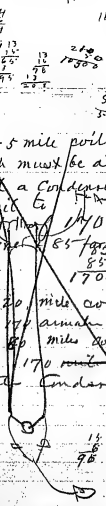
210
80
1800

1000.

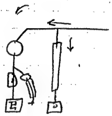
50
100
5000 7000

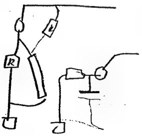
200 - 5 mile coils
to which must be attached
to equal a Condenser at
Each coil to
Equal of 170 armature
85 for Line 85 for Ground
85
85
170.

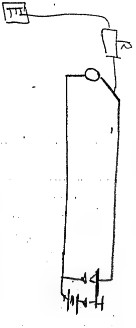
or
100 20 mile coils
+ 100 170 armature Condenser
or 50 80 miles coils,
+ 80 170 ~~coils to~~
armature Condensers



85.
16 17
6 5
96 85

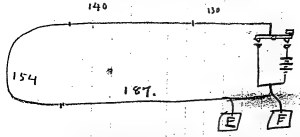

E


R



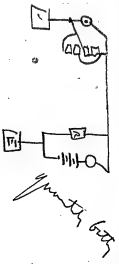
Greenwood Expt

Metallic Circuit?

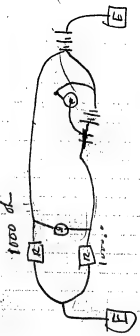


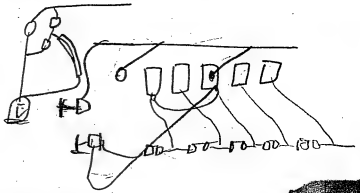
insert instrument and use perforated paper see what speed obtainable with Each section to earth direct & then with all sections on probable result at high speeds Cable on other side increase speed

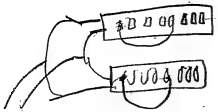
Charge Cable fully
+ Kill or balance
Straight line by boxes
Magnets thus —
& work quick will very
small spaces



Duplexing the Static
Charge

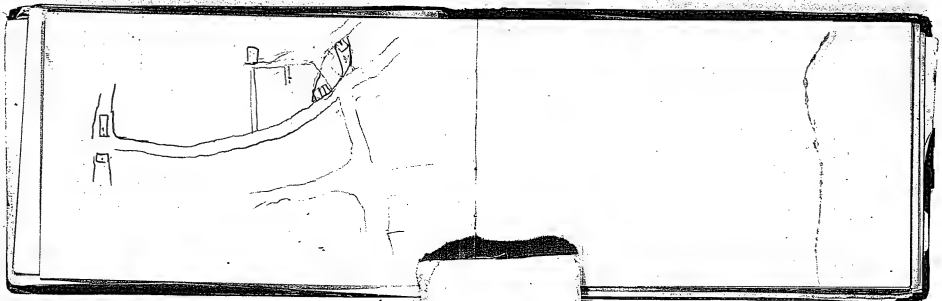


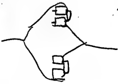




600

300.





also try the
one

32.
.6
192.

10.
1200

320
10
3200.

80.
4
320

320. R 10 miles each
320 C 10 " "

Equal 3 times A. Cable

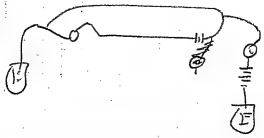
288. 1440
144
2

72
20
1440

6
8

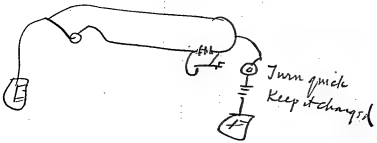
295

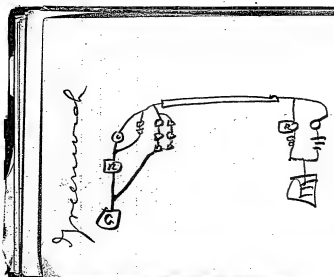
~~Mr~~ Siemens
No 3 Gt George St

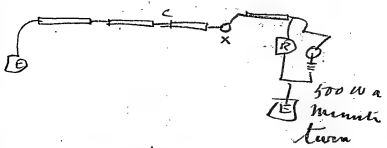


Also

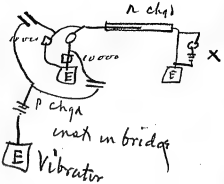
Turn quick
Keep it charged


Turn quick
Keep it charged





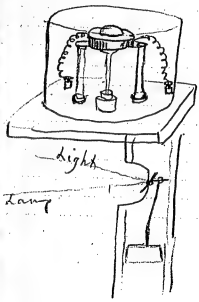
Then put X at. C'

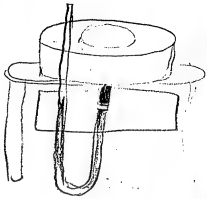


not in bridge

Good I think
Vary P chg battery
till it will charge
cable equal to
X trans battery

Cross in magnets so that it can be plain & gradually made Magnetic =



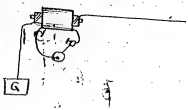


Heat Galvanometer

Cable perforation

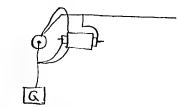
O ooooo o oo o ooo ooo oo o ooo

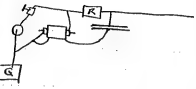
I h . 1 5 1 5

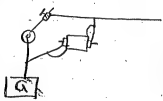


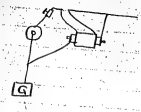
Experiment on the thinnest & thickest paper for reduction of R. & sensitiveness

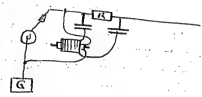
Organic & Inorganic colors paper bleached by ozone from pen.

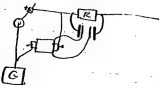










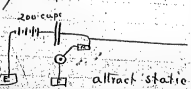


Test the length of the discharge on a fine wire spool & Coarse ditto with same battery

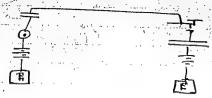
Test quantity of a number of very fine wire spools with seperate Coies, then all on one Core,

Test iron wire spools & magnets,

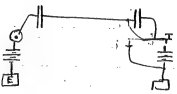
Magnetic shunt of high Res & use low battery power,



attract static

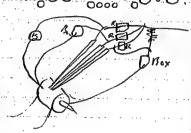


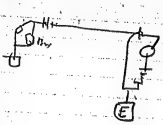
attraction of currents

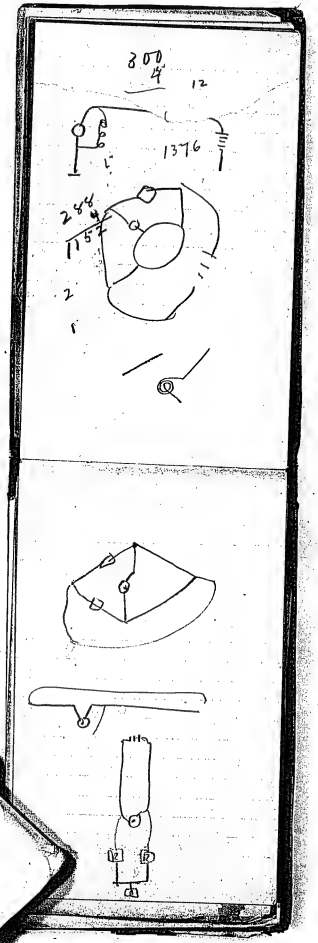


Magnetic Res with adjustbl Cores to vary discharge.

Cable Perforations



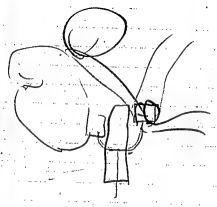

E


800
4
12
1376
288
4
1152
2
1

$$\begin{array}{r} 24 \\ \times\ 3 \\ \hline 72 \end{array}$$

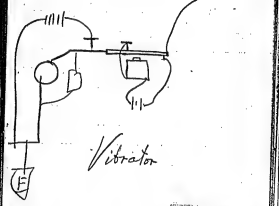
$$\begin{array}{r} 24 \\ \hline 314 \end{array}$$

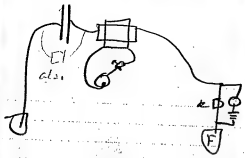
305

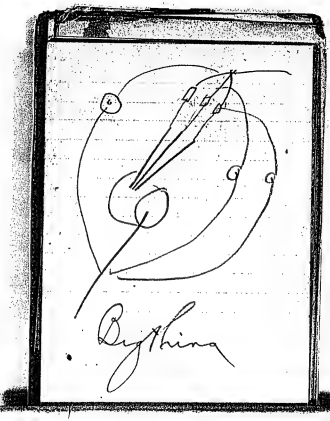


21

for high & Counter
weights Try
from iron wire welded
Copper & quantity


Vibrator
F

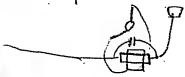

F


Bythina

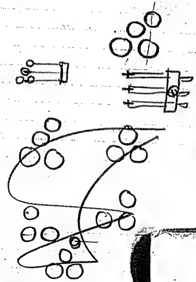
$$\begin{array}{r} 85 \\ 8 \\ \hline 680. \end{array}$$

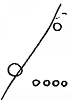
$$\begin{array}{r} 85 \\ 7 \\ \hline 595 \end{array}$$

$$\begin{array}{r} 85 \\ 6 \\ \hline 510 \end{array}$$



for a half Current
for a dash last
half circle





Use only one hole large
for dash & make oth
holes smaller
& sep pen marked

Ann
have 3 condensers
with wire coil put in
at Washn & Work
Condr System at NY
with Chan if good
send 3 Condrs
1/2 way bet W & Cha

within the circuit
~~to wire~~ So that it would
Exactly neutralize the
Static charge in
Somany Knots of
Cable, If these Bunches
Could be put on the
Cable & their Capacity
would remain as
Constant as the Capacity
of the Cable = it would
be valuable —

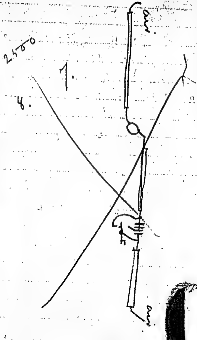
Try two ~~[illegible]~~ discs
of rubber on which
is a strip of zinc
& of Copper Connected
together = This should
still now another
disc 100th of an inch

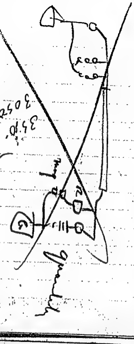
from & receives slowly & the with
~~[illegible]~~ rapidly This disc
has one strip Copper.
See if influence would
generate E. + Connect to
Sensitive Galvanometer =

Close Experiment
of organic growing one
Cotton & Bread
with the ozone of
the Sea ?

Often the Discovery
Just precedes or
Effulgent Exhaustion
of Reflective Power
the Poet.

Greenwich





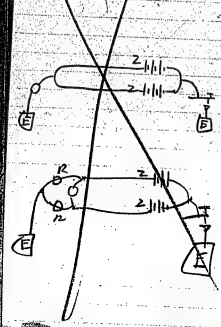
240.
270
295
312
310
1427

3200
73

3510'
3050 ft !

73
50
123

Greenwich

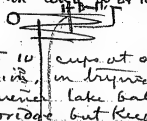


Charge & discharge a large Condenser or several large Condors, Through a very delicate high R Engine - Revolving Armature = So as to get a perpetual rotation in the Engine =

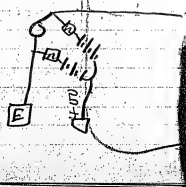
ascertain if some Magnetic arrangement might not be made so as to be included within the circuit

ascertain if on an artificial
of say 500 or even 100
miles, there will be any
difference between a battery
with zinc & Coke, or
Copper or other higher metal
& Coke = also on same
Cable see if there is any
difference between or see if
and record is made on at
least 500 miles of artfl
Cable by keeping a
quantity bulling of 10 cups
on & make signals by
pulling on ten & taking
off - the Extra ten arranged
to give extra quantity
only
also ascertain if
better signals can be

received over an art
with 50. Cups. Bridge put
& kept on line at recg
station and working

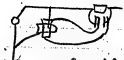


with 10 cups at sending
station, in trying the
difference take battery
out bridge but keep it
on & at same resistance
Then

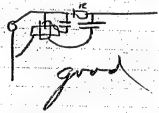


1 Knot.

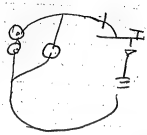
8 by 8.



Double Condr
high R Secdy
Chge C opposite



good



118
3.00
354.00

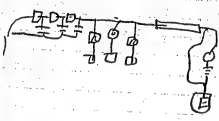
120
3.00
360.00

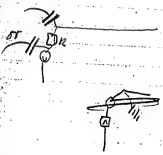
122
3.00
366.00

123
3.00
369.00

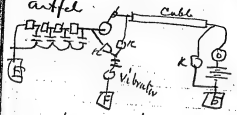
124
3.00
372.00

123 1/2
3.00
369.00





Try more wires in
Compensating magnet
also in that decinda
Inductin Coil Compensator



something in it

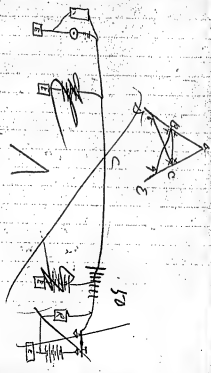
See if through 500,000 ohms anything can be put into the 1st circuit that will reduce its resistance = and obtain the mark with one cup of battery = In testing the sensitiveness of reduced paper test with one or two cups battery ~~through~~ 500,000. through this resistance Try and see which batty (2) cups Daniell or grove will give the mark quickest =

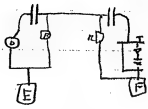
It may be that signals may be given with 20 cups grove

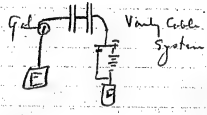
& spaces by 20 cups Daniel

Secondary Batteries

Have 6, foot square lead sheet or Coke Secondary Battery made to be used at receiving End these send back charge & act like a Condenser but how the arrangement that ~~[illegible]~~ / ~~[illegible]~~ a long back charge & low Resistance it may be that the current be put in the main if so place in circuit

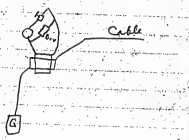






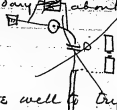
Try this. obtain some metal that will no decompose iodide & then attach it to the platena pen so as to reduce Russulena

Gutta P Wks
Wharf Road
City Road
N.



It is probable that the return magnetic charge can be obtained free & with less shunting of the current by this arrangement that directly by magnets. The primary coil should have probably 5000 ohms Res

& the secondary [illegible] about the same =



It might be well to try & see if the delicacy of the gear might not be increased by keeping it electrically charged or by passing a current (local) in opposite direction through it or by the addition of several cups in the secondary circuit [illegible] use no box on [illegible] the [illegible] cup

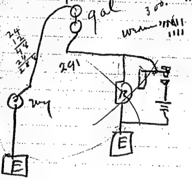
When I get home have 1000 cups glass 1/2 size Cable Gutta P cups made for testing at someones expense

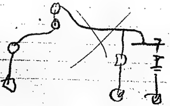
150
270
295
715

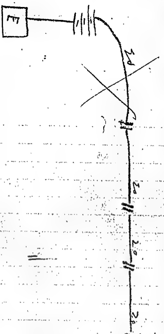
780.

3500
780
2720

9.



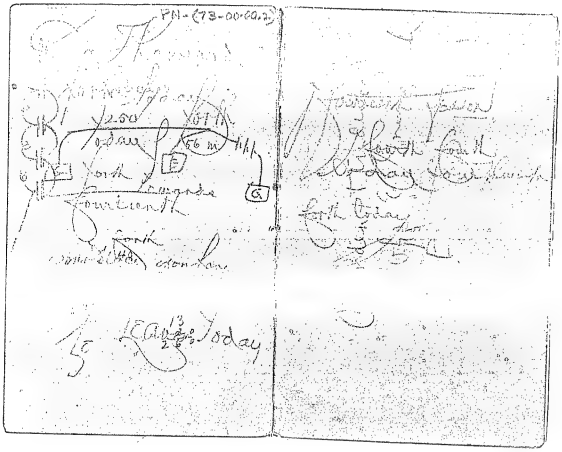




Pocket Notebook, PN-73-00-00.2

This undated notebook contains notes and drawings made by Edison during his trip to England in the spring of 1873. There are drawings of telegraph equipment, circuit diagrams, and notes on experiments. The book also contains a note on overhead wires in England and a list of English telegraph instrument manufacturers. Approximately 60 pages of this unnumbered book have been used. Several leaves have been torn out.

PN-C73-00-00.2

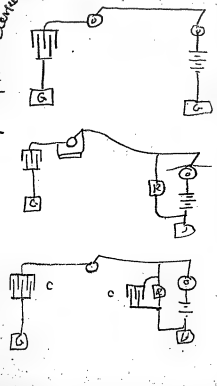


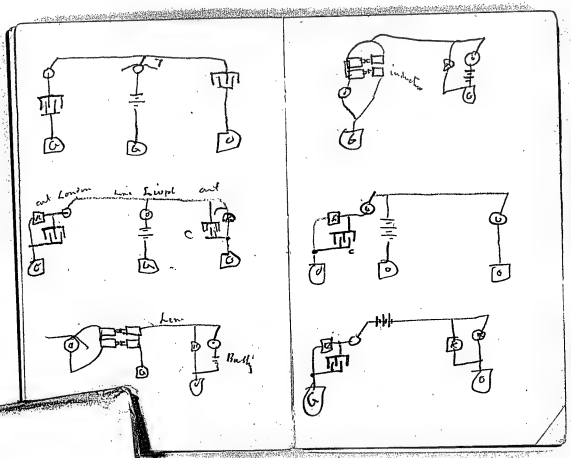
Tel. Inst makers
Henry Grant & Co 408½ Oxford St W
Chas Wm Meiter & Co 85 & 87
Grace Church st EC 11
Bishopsgate Ave EC & st Thomas
st Bromley E
Frank Russell & Co 2 Talbot
Court Grace Church EC
Julius Dax 105 & 7 Russell st
Bloomsbury ~~EC~~ WC.

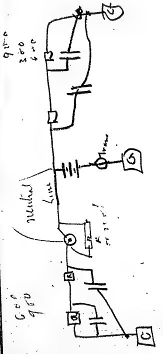
Zuber & Rieder Morse tel paper
Low Henle agt 3 Bridge Row EC

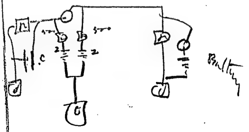
Ladd. 11 & 12 Beak st
Regent st.
Horatio Yeates
39 King Square Goswell Rd
EC
R Faulkner Second Hand
Appar. 40 Endell st W C

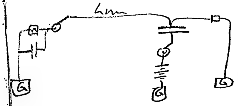
Woodworks - Foxcroft, 54 Compton st Clerkenwell EC




and London
Liverpool
and
Hull

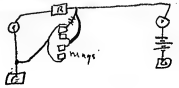


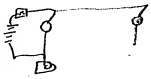


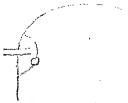


Pot gnd - 750.
700.

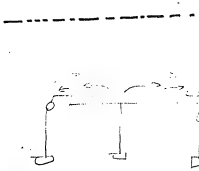
2800.



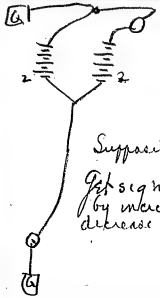




Get a resistance coil
German Silver wire
wound offpoints

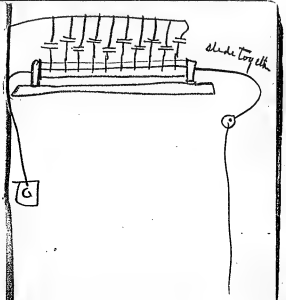


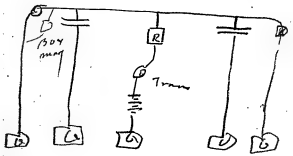
also



Suggestion

Get signals over by increase & decrease of quantity




D
BOY
may
R
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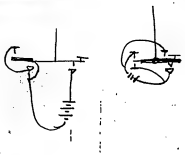
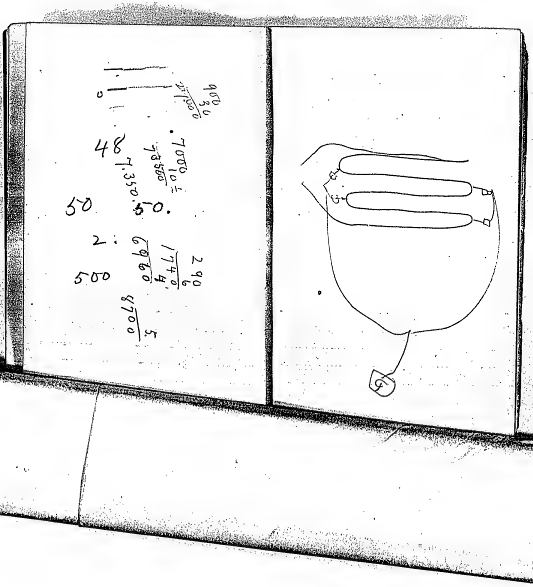




900
30
27000

48

.7000
10½
73500

7.350

50

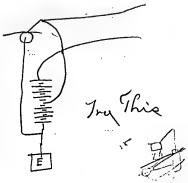
5 0.

2 :

290
6
1740
4
6960

500

8700
5

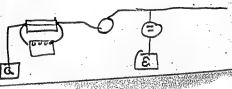


Try This

Buy 60 Bunsen or Box Trove Quantity

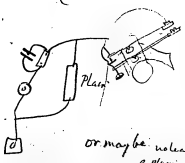
If PO get that Condon

Connect Thus



Take out 4 rolls or 8 paper

Have Wright connect 1/2 & 1/2 battery in quantity

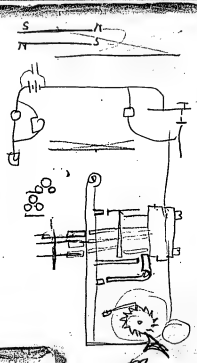


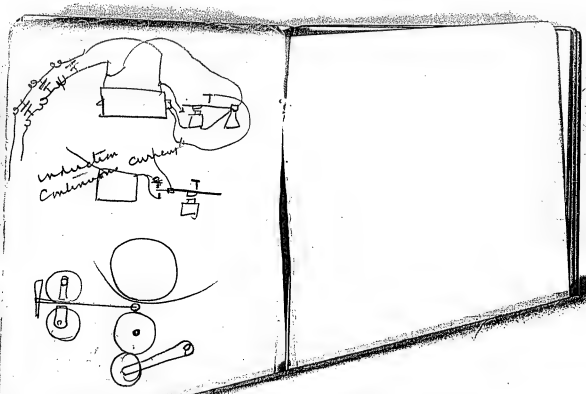
or maybe wheat

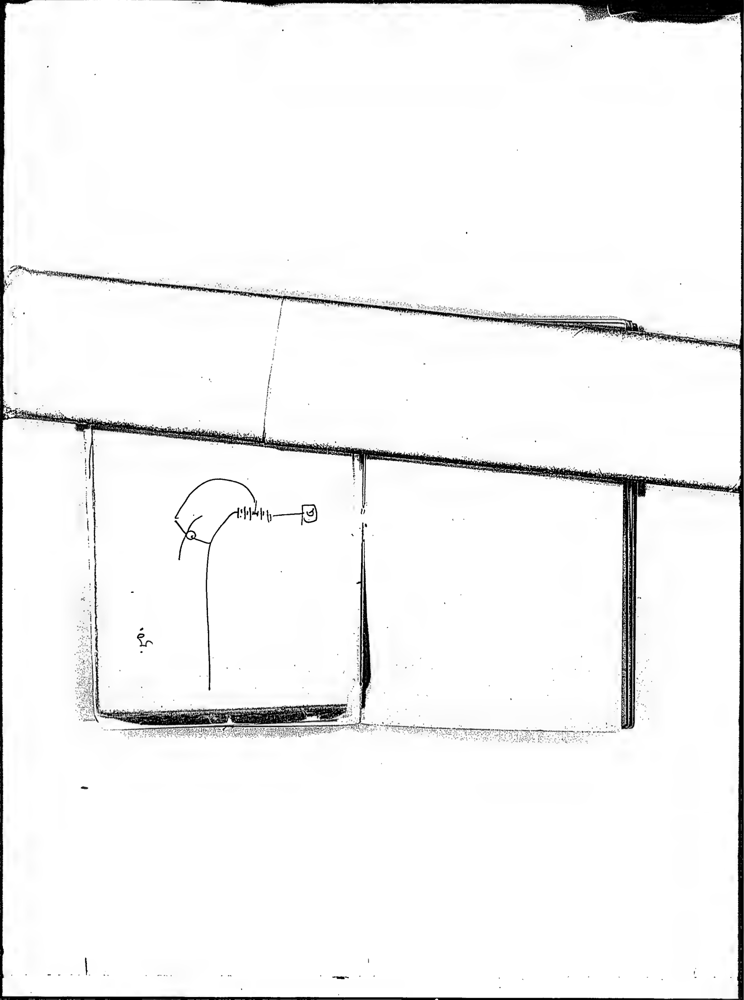
If I do as well or better with 80 Connected for quantity 40 + 40 then the Error lies in not having a quantity battery of 80 to supply the shunt

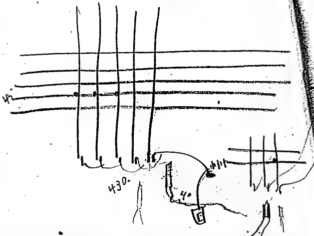
in printing punching:
Electric Engine and
Letter at time p + n
vibrator and etc

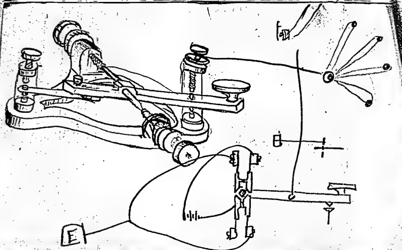
Iron paper make some

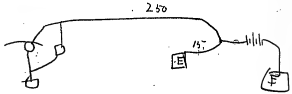



induction
current
Cylinder




4
430.
4°
E


E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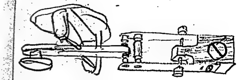

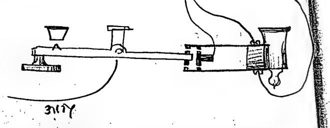
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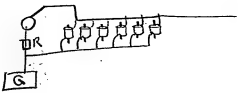


Each coil has 5000 ohms fine wire & 8 coil perfectly insulated with a bundle of well annealed iron wires for cores. The secondary should be some other kind of discharges

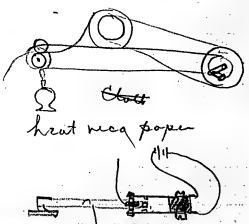
5000 200 50
6 3 3

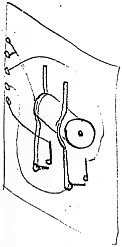
2 10. 6. 10
2 5 5
2½ 1500 2½

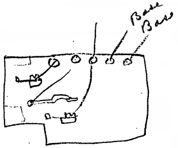
2/ 2500.
1250.
625

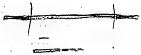
J E Wright
N W Hotel
Liverpool
N W R R Receiving
Nearest Relay
Off London & N W
Off
Piccadilly
Circus

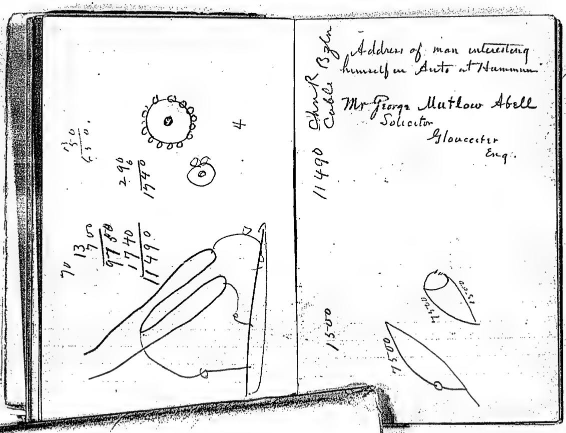
M Theiler
86 Cannon busy road N.






Base
Base





Address of man interesting himself in Auto at Hammam.

Mr George Matlow Abell
Solicitor
Gloucester
Eng.

11490 Chas R Cable Bzln

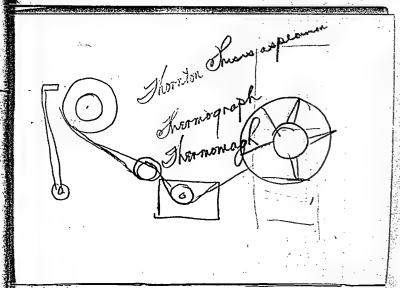
70
1350
9750
1740
11490

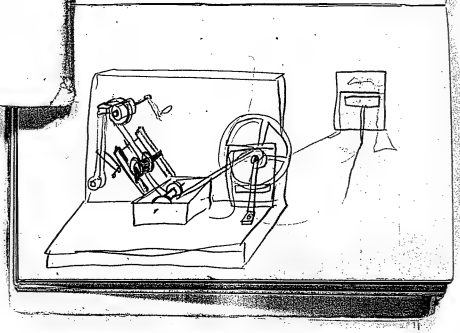
290
1740

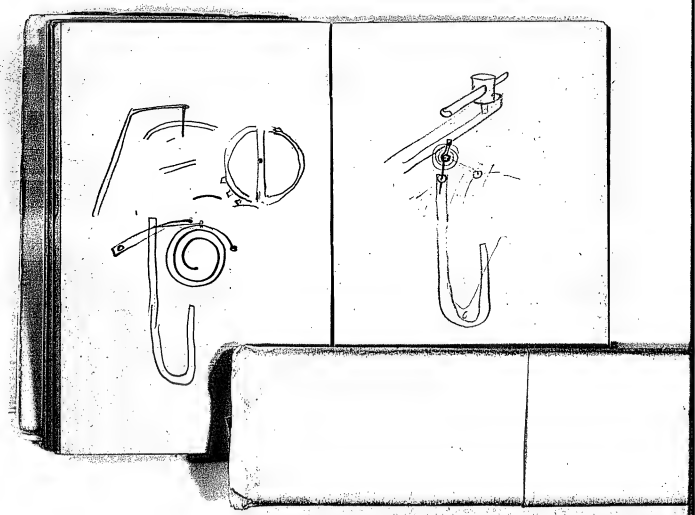
130
650

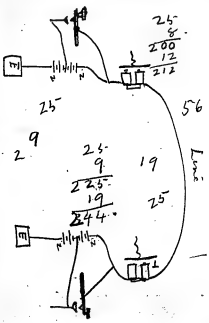
4

J E Wright


Thomas Phonograph
Phonograph
Phonograph






25
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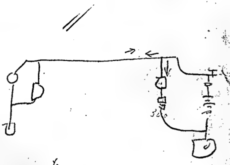
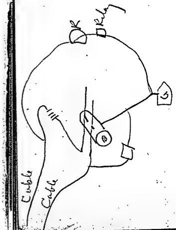
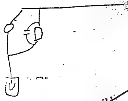
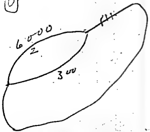


6 6000





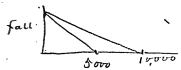


18

20
300
6000

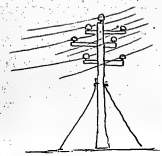
5000 ohms resistance

10,000 ohms resistance



Both holding same charge
Equal Electrostatic Capacity

The wires from London to Liverpool are the best strung wires I ever saw.



15 & 20 wires on one short pole

Pocket Notebook, PN-74-00-00.1

This notebook contains records of chemical experiments for the automatic telegraph, lists of parts, and lists of employees and their hourly rates. The entries are in the hand of Charles Batchelor. The book is undated but probably was begun early in 1873, since three of the workmen mentioned (Watchman, Carver, and Millis) appear in the time books only for March of that year. (See Cat. 1218, Accounts Series.) The cover is marked "Wages Price list." Eighteen pages of this unnumbered book have been used.

Wage Price list

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PN-(74-00-00.1)

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$450,000,00

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H. W. Little
21 Bouvoisin Place
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J. Beebe
Room of C. C. Bradford
90 Nassau st

W. Brado
454 West 23rd Street
Bet. 9 & 10 Ave
N. Y.

		cents per hour			
1	S. Dean	30.	X	—	
2	Wrenn	37½,	X		
3	Weber	~~22½~~, 35	X	—	
4	Debaine	30		—	
5	Kohler	22½	X		
6	Farrell	40,	X		
7	Wilkerson	26⅔	X		
8	E. Osborne	~~21⅞~~, 23 1/10,	X		
9	Boylan	~~10½~~	X		
10	Goodeam	9½	X		
11	Peterman	~~6⅔~~, 7½,	X		
12	Chandler	16⅔	X		
13	Kreiss	25		—	
14	Hodge	37½	X		
15	Egan	22½	X		
16	Valentine	30			
17	Hay	~~11⅞~~, 13½	X		
18	Schwartz	~~27½~~, 30,	X		
19	Hedden	~~6⅔~~			
20	Gunther	18⅔	X		
21	Kundig	32½	X		
22	Burrodge	~~27½~~ 30.			
23	A. Oehler	30			
24	Sup. Flagler	16⅔	X		
25	Sup. " Jun	16⅔			
26	Wm. Washburne	10			
27	Bardman	30	X		
28	Meader	35	—		
29	Bradt	35	—		
30	Graff	16⅔			
31	J. Cochrane	8⅓			
32	Morris	~~22½~~ 30	X		
33	Martindale	13⅓			
34	W. Cochrane	5			
35	Hagerman	21⅞			
36	~~Sutton~~	~~6⅔~~			
37	Malungo	10	X		
38	Oates	~~16⅔~~ 20	X		
39	Pelling	~~8⅓~~ 6⅔	X		
40	~~Sidon~~	~~6⅔~~			

C.	Washburne	~~8⅓~~ 10			Darius Hermanson	9½	
	Seler	~~6¼~~ 7½			Watchman	13⅓	
W	Fleming	7½			Carver	5½	—
	Ward	10			Miller	5	—
	Brunger	10					
A	Smith	6⅔					
	Hardridge	8⅓	×				
	Tierney	8⅓					
C	Fleming	~~8~~ 5⅔	×				
A	Rusey	10-11⅓	×				
W	Smith	7½					
B	Gillan	10					
C	Bird	7½					
J.	Bradley	~~5~~ 3 7½	—				
C	Gerringhuso	~~11½~~ 16⅔					
O	Muchenbach	20					
	Hal Bacon	~~4~~ 4⅓					
W	Oakle	5					
W	Pancoast	10					
	Miller Pancoast	8⅓					

Automatic

26	Roller pens Nickel						
1	Water Rheostat						
1	Stave Bust						
1	Friction wheel						
1	Full set for another Bust						
1	Con. spy Hammers						
7	Table Bulb						
2	Legs						
1	Friction Wheel						
1	Bust & holder						
2	Hammering pens & 1/2 holders						
6	Stiff Rec pens						
2	Repeater						
4	Tufor & Upsan						

Experiments with Ferrid-sol — iron pen

1 Hydrosulphuric Ac. / Cyanuret Potash	White paper, with lines	deep black mark: but fades ~~out~~
2 Ferrid Sol / Hydrosulphuric Ac.	Very light yellow paper	purple blue mark, very broad
3 Ferrid Sol. / Hydrosulph Ammonia	White paper	Black mark turns brown
4 Ferrocyanide Pot / Chloride Calcium / Hydrosulphuric Ac		

Antimoniate Pot. Chloride Sod. 5	White paper	Brown smart with lem pen					
Antimoniate Pot. Chl. Sodium 1 drop Hy. Sulph. ac.	White paper Brown smart						
					Chl. Chl		

No 1 Ferrid Sol. quick P.
No 2 Hydrosulphuric acid
antimoniate Pot
Chloride Lobin
Hydrosulphate of Ammonia
3 ditto more salts.
4 ditto ditto More Hydrosulphate of Ammonia
5 ditto ditto & a little ferrid Sol.
6 " " " " " & excess of Potash
7 " " " " " " & sulph. Magnesia
8 " " " " " " & excess of ditto
9 Ferridcyanide Pot.
Hyposulphite Soda
10 ditto more & less Ferrid.

1

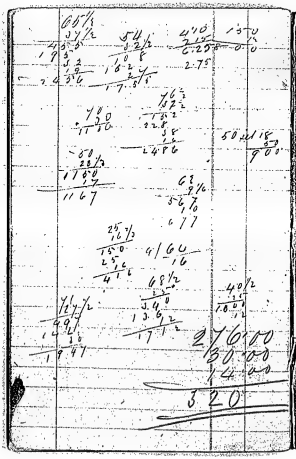
Solution:—
Hydrosulphate of Ammonia
Chloride of Sodium

Pens.	Remarks
Bismuth	none
Silver	none
Zinc	none
Copper	Reddish brown mark turns black later
Antimony	white mark fades out.
Tin	Red mark fades out
Nickel	Grayish black mark
Iron	Black mark
Lead	White mark
Platina	none

2 Solution

Get resistance of Iodine paper around 3 in a second + prevent the Iodine from insulating the paper. See if the resistance does decrease as you increase battery

Hydrosulphate of Ammonia, Salt, & Bichrom. Pot. Dirty brown precip. from perm. on mark



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Pianos &c. tuned and repaired.

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Opposite Newark Savings Bank. NEWARK, N. J.

Pocket Notebook, PN-73-03-26

This notebook contains notes, drawings, specifications, and price lists for telegraph equipment and component parts. Most of the entries are in the hand of Charles Batchelor. The dated entries are for March and April 1873. Much of the material is related to the manufacture of universal printers and stock tickers. Near the end of the book is a list labeled "Instruments that we lost," with the word "money" immediately above. The front cover is marked "Price Lists." Approximately 30 pages of this unnumbered book have been used.

Price List

In Account With

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FAMILY SEWING MACHINE

Can be paid for in small Monthly Installments.

181,260 Sold during the year 1871.

NO CANVASSERS EMPLOYED IN THIS CITY.

☞ *LEAVE YOUR ORDERS AT THE OFFICES.*

No. 766 Broad St. Newark, N. J.

O. T. Hopper & Co. Gen'l Ag'ts.

INMAN LINE

ROYAL MAIL STEAMSHIPS,

For PASSAGE

TO AND FROM

LIVERPOOL, QUEENSTOWN,

GLASGOW and LONDONDERRY;

AND STERLING DRAFTS

On ENGLAND, IRELAND and SCOTLAND,

Apply to J. WILSON SMYTH,

STATE AGENT; 744 BROAD ST. NEWARK.

PN-73-03-26

Price List
Stock Printer Parts

Printing lever Comp.	5	50
Magnet complete	3	20
Gear wheel ~~ahaft comp.~~		
Mounted with bour & Pin	1	60
Ink Roller		54
Mounted type wheel	11	50
Shield "		12
Paper feed clicks		40

Relay

Graining	60
Polishing Porc & Bd frames	22
Assembling Porc. fo & spg	20
Lining pulley	30
Lining mag., Pulls & wedges	
Plating & finishing spg &	20
Assembling	30
	182

Wed 26

~~25 Key bottom~~	
~~25 Circuit lever ditto~~	
200 Carbons	
~~Plating for batteries~~	
Rubber for sounder covers	

Sounder

Graining & Varnishing 75 pc.	40
Lining covers & d.	20
Assembling ditto	15

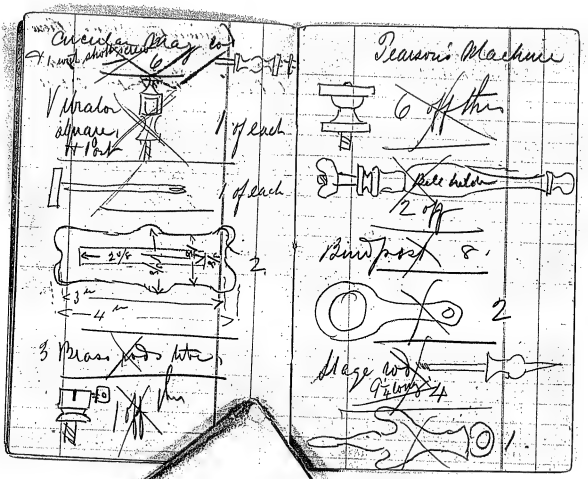
Keys

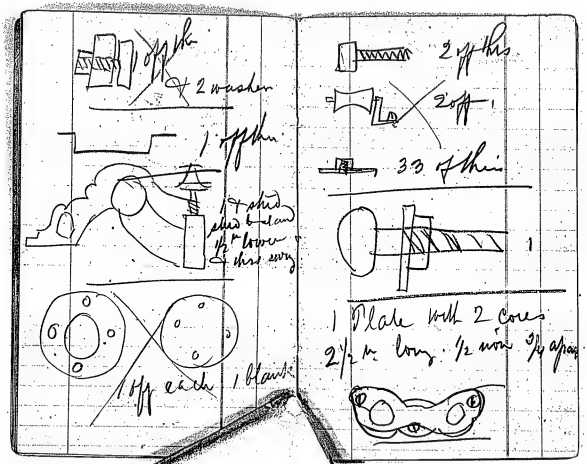
Graining & pol.	40
Water & dry plating	12
Assembling	15
	67

Respirator			Mainoch			
20	30	6.00	30½	37½	22	62
25	23⅞	5.83	62	35	21	70
35	37½	14.25	45	32½	15	60
5	18⅓	.90	62	30	18	60
22	20	4.40	30	20	10	50
56	32½	18.20	5	25	1	25
80	30	25.00	29	32½	9	42
3	30	.90	53	32½	14	22
20	37½	7.50	51	37½	19	13
100	37½	37.50	20	30	10	50
32½	30	9.75	36	37½	11	25
13	23⅞	3.75	25	37½	9	37
85	30	29.75	49	20	12	00
50	50	25.00	13	32½	4	22
51	50	187.75	10	37½	3	75
317	60	121.50	60	37½	19	50
14	50	2.00	8	37½	2	98
523	97					
Respirator Price			62.6½		209	61
Ad						
		32.90				

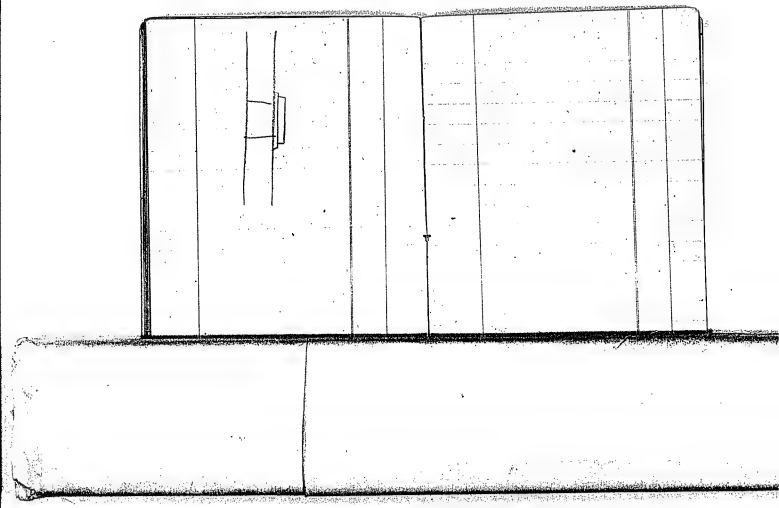
Experimental Gas & Recov.

Apl 6.					
626½	Ad	actual 209.61		34	60
				34	90


Pearson's Machine
6 off thin
1 of each
1 of each
2 off
8.
2
1.
2 1/2
3"
4"
2.
3 Brass
1 off thin


1 of the
2 washers
1 of the
1 of each
1 Plate
2 of this
2 of
33 of this
1
1 Plate with 2 cores
2½ in. long. ½ wide ¾ apart

Pearson's Machine				Stock & Repairs			
				3.33, 1.64, 2.00		6	97
1/2 lb. Wire at 70		1	00				
1 lb. Patch ~~2.00~~		2	00				
9 in. Patch Cost ~~4.27~~		4	27				



Bills

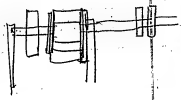
Feb 26 1873

Feb 26 1873 Wrell

Tables not included

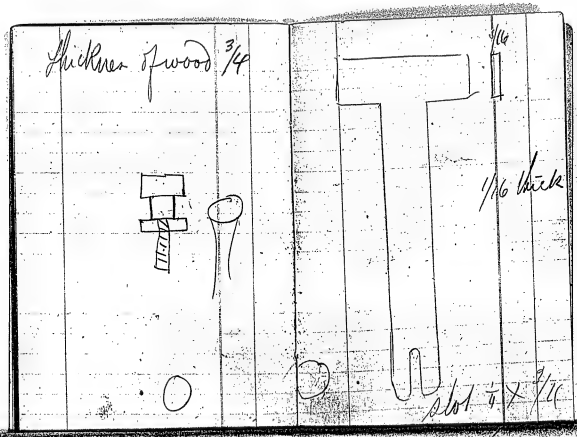
150	Batteries	2	360
6	Relays	18	108
6	Keys	6	36
6	Sounders	6	36
2	Vibrator resistance		

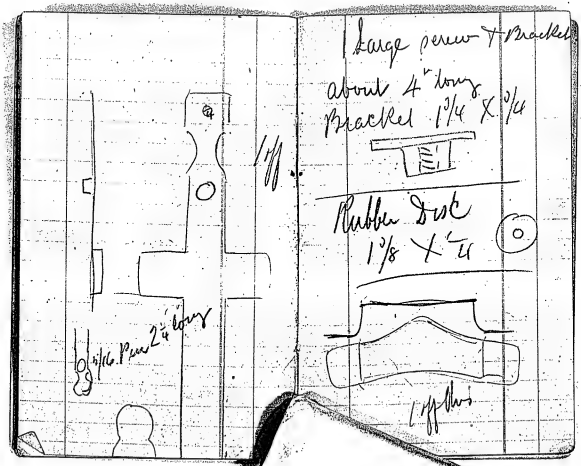
28

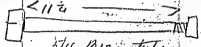


	10	Lathe	10				Transmitter	
	1	Lathe	1				Planer & Drill Press	
	21	Cones	21				Drill arm	
395	24	Relay	15	24			Pulleys & shafts	
	37		37				flat spring	
	9	Rounder	9					
		189 - 25						
		25						
Key		1700						
		Casting for pumps	800					
			200					

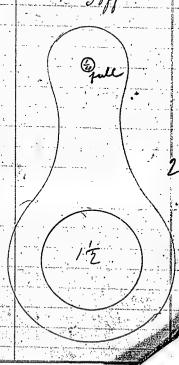
	Forces								
75	Making tools		262	50					
2600	Winding spools	7¢	182	07					
2600	Cones.	5	130						
1300	Reepers	3	39						
400 lb.	Cop cotton	wire	850						
400	Pulling spools	15	60						
1300	Burn heater	20¢	260						
100	Rubbers	7	7						
100	Steel boots	10	10						
			50						
			1800	50					


Thickness of wood 3/4
3/16
1/16 thick
slot 1/4 X 9/16


1/8
3/16 Pin 2 1/4 long
Large screw & Bracket
about 4" long
Bracket 1 3/4 X 3/4
Rubber Disk
1 1/8 X 1/4
Lifter



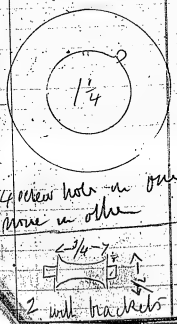
3/16 Brass tube
3 off



2 off this

Shunts

1	Rubber	350	350
4	Copper	60	240
0	Bulbposts	18	9



2

4 screw holes in one
none in other

2 with brackets

	New Universal P.					10 lb. Brass.	45	4	50
	10 lb. Brass cast	65	7	95		25 lbs. Fol	40	10	00
	Rubber roller	—	5			263 lbs	40	105	20
	Engine		25			32	40	12	80
	Paper guide complete		3	50		39	40	15	60
	Brass detto		3	50		Wood.			70
	Printing Lever		3						
	6 long center screws			90					
Apl 12	25 lbs. Labour at	60	15	00					
	4 complete magnet		12						
	Wood			70					
17	263 lbs.	60	157	80					
	39/100 37½ "	14	63	30					
	10,37½ "	15	5.						

Money	Instruments that be lost	Piece Work Price		
1	Muney's patent (Camp)	1	Fell & Pinter repair	2 75
2	First toys & tools for them	2	Lounder & Rup?	1 50
3	Edison's instruments for W.U.Tel.		Assembling etc	
4	Universal attachment			
5	Paper writing machine			
6	Edison's paper for electric engine			
7	Moving from other shop.			
8	Work & tools for toy engine			
9				
10	Compounded & put Money in separate when			
11				
12				
13				
14				
15				
16				
17				
18				

Motor Co Dr
1/8 Smith street

Aut. Del Co. Dr
to H. Aut patent Pat.
90 00

to friend Relay
Sept 10 10

Sept 7.
33 & 1154 X 25 =

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Pocket Notebook, PN-73-04-30.1

This notebook contains drawings and price lists of telegraph parts, price lists of batteries and chemicals, and employee time records. Most of the entries are in the hand of Charles Batchelor. The employee time records are dated April 30-May 14. There is an additional entry for Friday, May 23 (probably 1873). The front cover is marked "Price list." Fourteen pages of this unnumbered book have been used.

Price list

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Apply to J. WILSON SMYTH,

STATE AGENT; 744 BROAD ST. NEWARK

H. McNALLY, Publisher, 153 and 155 Mulberry St. Newark, N. J.

Price list of Parts of Relay

Relay	18		
Sounder	6	50	
Key	5	50	
Single Morse	6		
Registers	45		

Bindposts		per 100	each
No 1 size Instrument		18.00	18c
2 size small		13.00	14
No 1 size with screw		18.00	20c
Double Connection		23.40	25

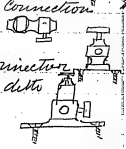

Table Connector
Double ditto

Office fixtures
Message Hooks
per day 75

Battery Carbon No 1

Carbon Battery No 1 ½

	per 100.	each
Carbon ———	40.00	50
Carbon clamps.	18.00	20
Carbon Connection	25.00	30
Porous Cups. (Cards)	1.20	14
Glass Jars (Cards)	4.00	3 ½
Zincs per doz	6.50	~~[illegible]~~ 60
Complete Cup, per doz	22.00	2.00

length	6	8	10	12	14	16	18	20	24	~~per gross~~	per 100
	Machine Screws										
1/4	94	100	100								
3/8	94	100	100								
1/2	94	100	100								
5/8		100	120								
3/4		100	120								
7/8		115	120								
1		125	130								
1 1/4			160								
1 1/2			150								

31 Ap May 7 - 1c

Wmott 183. = all.
40 Record Just

Rhenn 50 Drunkers
36 to 59. 60.

J Madden 56. 57. 57.

Heise (153) Ans. 103 Indue

Schwab 110 W altogether
27.6 Indue

Hoffler 63 30 Indue
48. —
55 —

Mary Lane 111 —
Stay or Indue.

Matthews 180.
Dudley 60. 60. 60. — (180 Indue)
Frederick Ott. 95 - (Indue)
Jolly 20 (Indued)
Jolly 60 60 62. (182 Indue)
Thos Todd 31 - (Indue.

Ed 180. (120 Indue)
C F Fenning 70 86 76.
Indue Ed Record
Mathews 20.00 20.00
Rhenn. 9.75 3.25
Heise 25 23.25
Lehwalt 6.75
9.75
6 190
9
96
2.50
9
2
23
107.75

Wert und Zweck May 23 (1873) KAS.

Kurth 60.
~~Kunz 50 fr~~ ~~20 Franken~~
Kohler
~~Stanczy 50 fr~~ Celleum
~~Hilp 39 fr 20 ich francs~~ 20 Zink-Kelles.
~~Schwarz 19 fr 20 fr Lira 19 fr~~ 20 Bronze Knopf + Bosepermuter
Hilp Franz 60 fr (20 Zink ucker)
Gartmann 60
~~Bilney 60~~
~~Ott 50 fr.~~
Zilling 70 fr
~~Schumann 60~~
Pfost 60
~~Schorre 60~~
Flemming
Nabsinger 50

Mrs Frazier	20	4	00
Hedge	39	11	75
Ell	25	1	80
	61 7½	4	50
Pillins	35 8½	2	88
Brown	50	11	50
Ford	60	3	
Sulay	50	5	
Mallinp	50	5	
		49	43

Brown
Pillins

Rieser	37 Hotel	54	~~54~~
Robles	123 - 60		
Moore	57	55	-
~~Anderson~~	~~49 — 57~~		~~50~~
~~Hedge~~	~~55~~		
~~Ashworth~~	~~55~~		
~~Gaynor~~	~~60 — 55~~		
~~Hall~~			
~~Wallerman~~	~~45 — 60~~		
~~Ford~~	~~60 — 60~~		
Frank Gray	60. - 20		
~~Pillins~~	~~4250 x 7/100~~		
	~~12 d.~~		
	~~Contrado 60.~~		
~~Sulay~~	~~50 b. — 60~~		
~~Wallerup~~	~~12 b — 60~~		
Martinelli	60 b — 19 bu		19 bu
~~Flemmy~~	~~68~~	74	70
~~Flat~~	~~13 b~~		
Rudolph 42. Greenwood			

Drugs.

Sulphuric Acid per lb.	04
Bichloride per lb.	08
Blue Vitriol	
Bichromate Potash	
Platina per dwt	45

1.35 144 :
144 135 : 100
144 / 135.00 / 94
/ 1296
540

165 144 : 15
165 / 144 = 9
165

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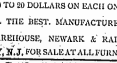

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Pocket Notebook, PN-73-04-30

This notebook contains notes and drawings on telegraph and battery experiments. All are by Charles Batchelor except for one page by Edison. The first page is dated Sunday, September 7 (probably 1873); the only other dated entry is for March 18. On the last page is a description, signed by Batchelor, of a visit by an unnamed person. The front cover is marked "Experiments" in ink, with "Batch" written in pencil underneath. Thirteen pages of this unnumbered book have been used.

Estimates

In Account with

Bell

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PN-(73)-09-30

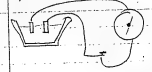
Lab. Friday.

Made Ferrid cyanide of Potassium

1 of Ferrocyanide of Potassium
3 of Water; dissolve.

Mix 1 part of Black oxide Manganese with 2 parts of strong Hydrochloric acid in glass retort & subject to gentle heat. ~~Chlorine~~ Chlorine gas will be released which must be passed through the above solution till it becomes of a reddish green color & will not give a blue precipitate with a persoxide of Iron

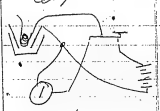
Experiment.



2 Platina plates in water
rate deflection through mirror
farthest side

~~6 [illegible]~~		fritted	constant
Platina plates	2" apart	6	3/4
" "	6 apart	5½	
	12 "	5	
	18 "	4	

Exp No 1



Distance of scale from Mirror 70 cm

Distance of Platina from cable 3"

Length of cable

Resistance of Iron 113 ohms

Resistance of Galvan 9100 ohms

Constant 6

105 Small cups

Z to Cable			
Time	pulled defl	time to break	start time
10 sec.	$1\frac{3}{4}$	30 sec	3·3
20 sec	2	36	3·3
40 sec	$2\frac{1}{4}$	35	3·7
90 sec	$2\frac{3}{4}$ —	40	3·9
90 sec	$2\frac{3}{4}$ —	39	3·7
180 sec	$3\frac{1}{3}$	40	3·7

here it reached 1 degree to right first it comes to zero when I ~~[illegible]~~ [illegible] put bat into cable

try again T and Z to zero by magnet

180 sec.	2	30	3·23
180 sec	2	30	3·27

it deflects a degree to right when I pull battery through cable

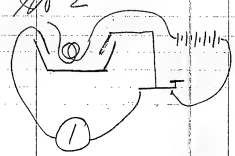
180 sec	$2\frac{1}{4}$	28	3·42
20 sec	$2\frac{1}{4}$		3·51

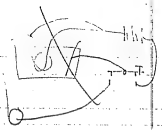
over

Length sec.	degrees	time sec.	degrees	time
30 sec	2 1/2	30		4.00
when I close key it moves half a degree in opposite direc				
90	3	30		4.12
I seem to get an electrostatic which arises from the cable + shall bery a battery				
Copper to Cable.				
10 sec.	0 carcely [illegible]			4.0
30 sec.	very [illegible]			4.9
300 sec.	1/2 deg.			4.11
				4.14
Zinc to Cable				
30 sec	1	25		4.23
60 sec	1 1/4	31		4.24
600 sec	2 1/2			4.40
Cop. Cable				4.50
210 sec	4			4.50
60 sec about normal				4.47

Lead with 2100 Shunt
to get greater deflection
Lines cable
see def. unit 121. Line
435

No 2





constant 24 Ma. [illegible]

Zinc & Cable deflection left

10 sec	3½	30	5.5
20 sec	5	35	5.6
60	6	40	5.74
120.	6	40	5.9

Copper & Cable. neg. [illegible]

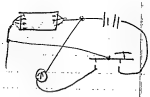
10 sec	4	30	5.26
20	2	25	5.28
60	2	28	5.31
120 nearly	2	—	5.33

Zinc & Cable

10.	4	35	
20	5	35	
60	5	35	
120	5	35	

Try 1 Carb. battery on
Large secondary note
deflection every few
minutes " " Hour

Try Condenser with
the 2 boxes of
batteries. Same as used on
Cable -



Small batteries
for testing purposes.

March 18. Noon

No.	1	2	3	4
1				
2	49½	26	6½	½
3	50	28	7	½
4	52	46		
5	57½	27½	9	1
6				

	Poole	St	
	2 Pr Rubber	95	
	94 7/8 line at		

9

He has only just left
I took him all through
the shop & explained
to him the value & use
of all our tools & he
seemed to think we
had layed out lots of
money I told him they
were all new & valuable
He said very little but
thanked me for my
kindness as I thought
he was just a friend

Batchelor

269
96
5
1280
1544
300
1844
271 496
225 330
330 8.26
2670
800
200

26·
1544
300
1844
826
2670
265
2935

Arbeiter, ſpart Euer ſchwer verdientes Geld!

Indem Ihr Eure Lebensmittel im größten und billigſten Waarenlager dieſer Stadt kauft. Wir entnehmen Thee und Kaffee direkt vom Importeur und durch große, langjährige Geſchäfts-Erfahrung, ſowie der größten Sorgfalt bei Auswahl unſerer Vorräthe, ſind wir im Stande, für Euer Geld beſſere Waaren zu geben, als irgend ein anderes Haus in dieſer Branche, beſonders aber als diejenigen Handlungen, welche nur Thee und Kaffee führen, und zwar aus dem Grunde, weil wir eine Menge anderer Artikel verkaufen, auf welche wir unſere Unkoſten vertheilen können. Jene aber ſind gezwungen entweder hohe Preiſe zu verlangen, oder ſchlechtere Waaren zu verkaufen um ihre Koſten herauszuſchlagen. Mehl der verſchiedenſten Brände bekommen wir direkt aus den Mühlen und iſt bei uns das Hauptquartier des Mehlhandels in Newark. Der Kürze halber können wir keine Liſte aller der Artikel geben, die wir führen, aber um uns gerecht zu werden machen wir auf unſer Wein- und Liqueur-Departement aufmerkſam. Wenn Ihr irgend etwas daraus nöthig habt, ob zum Selbſtgebrauch oder zum Wiederverkauf, ſo wird es Euer Vortheil ſein, wenn Ihr unſere Vorräthe prüft, welche jeden Vergleich beſtehen, und Ihr werdet finden, daß wir 20 Procent billiger verkaufen, als die Händler, welche nur Wein und Liqueure führen. Wenn Ihr fragt, wie das möglich iſt, ſo antworten wir: Unſere Unkoſten werden nicht größer wenn wir einige Artikel mehr führen, im Gegentheil; aber jene die nur Weine u. ſ. w. verkaufen, müſſen ihre Unkoſten allein auf dieſen Artikel ſchlagen — daher ſind wir im Stande billiger zu verkaufen. — Allen, die ſich der großen Hitze ausſetzen müſſen, ſowie den Schwachen, welche Reizmittel brauchen, empfehlen wir unſeren 6 Jahre alten Bourbon; wir garantiren ſeine Reinheit, er enthält kein Fuſelöl, macht nicht verrückt, ſondern ſtärkt, und es iſt bekannt, daß er Kranken Kräfte gab wo alle anderen Reizmittel nicht mehr anſchlagen wollten. Dieſe Thatſache könnten wir, wenn nöthig, mit zahlloſen Atteſten beweiſen, aber uns genügt, an das Sprichwort zu erinnern: Unverſucht ſchmeckt nicht. — Verſucht ihn einmal und ihr werdet keinen anderen mehr trinken wollen.

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839 BROAD ST.

Pocket Notebook, PN-73-11-27

This notebook contains records of chemical experiments (some executed, some only proposed) relating to automatic telegraphy and batteries. The cover is marked "Experiments made by Chas. Batchelor" and the entries are in his hand. The only entry with a complete date is for November 27, 1873. Two loose leaves by Edison and Batchelor, written on the back of American Telegraph Works notepaper, have been inserted into the notebook. They contain notes on chemical experiments. Approximately 20 pages of this unnumbered book have been used.

Experiments
~~In Account with~~
Chas Batchelor

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O. T. Hopper & Co. Gen'l Ag'ts.

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AND STERLING DRAFTS.

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B. McNALLY, Publisher, 153 and 155 Market St., Newark, N. J.

Experiments. Copper

1 Make a sol. of Lequo Ox Iron
" " Ferr Cy of Potass.
Saturate some sheets of
his paper with the Ferr Cy.
Write a message using the
lequo Ox as an ink & copy
onto the Ferr Cy paper.

Result failure

2 Vice Versa —
Result
failure

3. Show a dot of Nitrate of Cobalt
write with, & damp sheet
with weak solution of Oxalic
Ac. (See Text)
Result

4. Write with Sherry Wt. S.S.;
copy on damp paper & expose
to sunlight
Result.

5. Write with decot. Galls
damp paper w sol.
Chlor. Ammony (yellow copy)
Result

6. Write with solution
Chlor. Cobalt or Chlor. Nickel
damp sheet & copy
heat & copy with Iron
green
Result.—

7. Write with sulphide of
Potassium & damp sheet
with Acetate of Lead.
Result.

Mix with alkaline test (Anchusa tinctoria) damp with suspicious spots: examine etc. in pure red wine.
Result:—

Mix with strong acid of 0 ounce of Bichromate Pot. & damp paper in Mix. (Sulphate.)

Mix with Bichloride of Iron & damp paper with Tannic Ac. or Gallic Ac. = In K Black color

Mix with Strong Sulphuric Ac & damp paper with a chlorate Red color.

Dry mixing with a protoxide of Iron & damper with Kd. sol.

Mix with Lime of Logwood & Damp paper in Sulph Iron.

1 Sulphuric acid [illegible]

Battery Experiments — Bradley Gale

No 27. 1½ cells Carbon Pot made carbon! 8 p.m. Nov. 28

Electrode	Inside	Depolarizer					Upper Surface Resistance	Lower Surface Resistance	Volts	Amps	Ohms	1	2	3	4
1 Water	Water	17	5°	1°			10.56	3.20	52	6½	1	2	314	79	53	12	—
2 Water	Pot Porous	69°	70½	73	24½		10.25	[illegible]	46½	46½	25	17	36	27	27	43	12
Sulphuric Sulph ac	Water 25 oz	57½	52½	23	44½		10.15	2.49	25½	10½	37	8		26	27½	36	7
" "	Water 3 oz Sulph acid 3 oz	56	56½	15	1½		10.49	3.46	25	13	7	X		11	7	6	1
5 "	Water 3 oz Oil Vit 1 oz	57½	46	23½	5½		10.58	2.49	23	22½	20	2½		39	28	10	1
6 "	Water 3 oz Nitric ac 1 oz	35	56	12½	2		10.08	2.52	25½	25½	11	1		19	18	6	1
7 "	Water 3 oz Sulph Cop 1 oz	57	52	40½	7½		11.15	2.54	28	27	22½	5		46	00	29	5
8 "	Water 3 oz Sulphuric 1 oz	56½	57	12	2		11.22	3.50	23½	23	16½	2½		17	12	6	1
9 "	Water 3 oz Sulphuric ac 1 oz	52½	52½	5	1		11.30	3.03	22	22	17½	1		5	17	7	1
10 "	Water 3 oz Sulphuric 1 oz	53	55	17½	2½		11.38	3.02	30½	18	5	X		26	11	2	X
11	Old Sulph Zinc	54	53½	4	½		11.50	3.46	23	17½	5½	1		21	12	6	1
12	Old Sulphuric ac Zinc	57½	53½	7½	½		11.53	3.09	30	19	6	1		23	16	5	1
13	Hydro Sulph Zinc	63½	65½	65½	3½		11.58	3.16	36½	23	8	1		20	12	6	X
14	Hydro Sulph Zinc	60½	52½	10	1		12.20	3.13	36½	22½	7	1		24	17	6	1

1 Sulph ac

Nov. 27. 5 p.m. Gravity

New Battery Sulphate Iron bottom

Iron plates 1½ inches above

Zinc 2 ft. below above

+ 2 ft. Sulph

Zinc added

Make 2 Salt water batteries

1 Copper + Zinc

2 Zinc + Carbon

3 Carbon + Iron

Just made Defect

	1	2	3	4
	32½	22	6½	2
16hr.	10	8	4	—
Nov 28 10 p.m.	10	9	¼	

Batteries Iron in Place of Zinc Nov 27. 1873.

	Outside	Inside	Test	Time		
Ma			1 2 3 4			Battery 15
73	Voltage	Voltage				
	Acid	Nitric Acid	68 67 66 10	10 AM	Nov 27	
	"	"	6 6 9 2	10 pm	" 28.	

Battery 16

Outside	Inside	Time	Date	Test 1	2	3	4
Dil Sulph Ac	Sulphuric Acid	10 PM	Aug 28	8	8½	19	6½

To night 10 hr after proved this a perfect failure

Experiment

Burn a taper in clean narrow mouth bottle & taper goes out — cause formation of Carbonic Acid gas from the carbon contained in wax. & when Tried. I put a little lime water in the bottle & it became milky — formation of Carbonate of lime

Put some flowers of sulphur in a clean flask & above it heat it after burning — over a spirit lamp, it soon melts & gets darker in colour. & boils after then burns.

Get an old bottle without bottom put in a basin of water fill it which float a piece of burning phosphorus after a while it goes out & you find more water in the jar the phosphorus burn the O in the air leaving the N in the jar which will put out a taper

Breath out the air from your lungs through clear lime water it will become milky due to the formation of chalk in Carb. Lime from the

Experiment —
Dissolve Molybdic acid in saturated con. sulph ac with heat an uncolored fluid is obtained. Place a little phosphorus acid in a porcelain dish, heat lightly & there is seen to rise off white vapors, add a certain quantity of absolute alcohol, a beautiful blue color is produced in fluid.

Solutions made

1 Nitrate of Copper made
Copper filings
Nitric acid dil.
Blue color set aside to crystallize

2 Arsenate of Ammonia made
Concent. sol. Arsenic ac.
saturated with Ammon. or Carb. Ammonia
set aside to crystallize
white solution

3 Phosphate of Ammonia
Phosphoric Acid. Concent. sol.
Carbonat Am. to saturation
set aside

5 Carbonate of Zinc
1 oz Sulph Zinc
1 oz Carb Soda
½ pint boiling water

6 Ammoniated Copper.
Sulph Copper ¼ oz.
Carb Amm. 3 drachms ½ dist
Rub them together in glass mortar
wrap in cloth, paper
& dry with gentle heat
to be kept in glass stopper bottles
Gives a beautiful purple colour.

7 Nitrate of Iron (Pharmac 1867)
Iron wire ½ oz. Pure.
Nitric Ac Sp. g. 1.42 1½ F oz
Dist Ac 1 Pint water
add Iron 1 drach at a time
agitate
allow to dissolve
filter sol. till gas ceases.
heat to 160 Far
Drop in Nitric Ac — —
till it acquires
bright red col
& treated with Ammonia
a red ppt. without
any tinge of green
add enough water to
measure of 15 F oz

Pharma. P. 602

8. Nitrate of Lead

Litharge, pled lead 2½ oz. 1 ⅝ or
¼ Pint Nit. Ac Sup mean
dissolve litharge to aid
with gentle heat
filter & set aside to crystal.
Concentrate the residual
liquid to get more
crystals

Sending shunts

The		The number total
1	5	5
2	10	11
3	15	19
4	19	20
5	49	50
6	100	105
7	200	215
8	490	500
9	995	1009
10		
11		

Bergman's line 20th
20th line

Dec 19 Due Batch 432.14

Kohler Stawkel 40 L

Debaun Bose 50 L

Gudet + Figuier 60 L

Edison — No 1 —

Iodide of Potassium

No 2	Sulphate	Mang Quess	
6	Lack	Chl and Cotton	
782	1138	797	
1126	859	789	595
559	1008	80	438
405	1128	410	360
300	1148	507	911
496	387	1055	
796	1020	771	
	537	1064	
		406	

Carb Zinc

1 oz Sulph Zinc
1 oz Carb Soda
½ pint water boiling
Take a portion of each time Sul Z & Carb S separate then put together in remainder within 48 hrs set aside for powder to subside when subsided pour off liquid wash precip with hot water till tasteless then dry
Phone P 1350

Sulphate of Copper ½ oz
Carb Am. 3 drachms
rub them together in glass mortar
wrap in filter paper
Tobey work well
& kept in glass stopped bottles

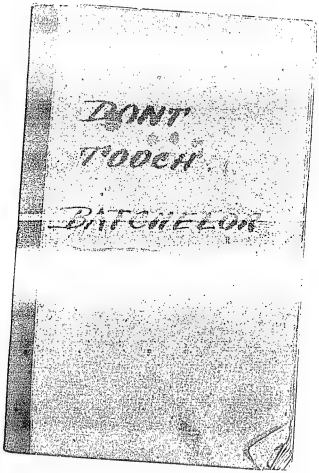
Ammoniated Copper

Page 985

[ITEM FOUND IN BOOK]

Pocket Notebook, PN-74-01-20

This notebook contains details of chemical experiments relating to batteries. The cover is marked "DONT TOUCH BATCHELOR" and most of the entries are in his hand. The book also contains a list of "Finished work" and a list of piecework done by various workmen. The year is probably 1875, since the entry for employee Kraft for May 20 corresponds with that in Kraft's 1875 time book, PN-75-01-08, Accounts Series. Approximately 20 pages of this unnumbered book have been used.


DONT
TOUCH
PITCHELOW

[illegible] 1[illegible]d mark

Jan 20 [illegible] 2 [illegible]
[illegible] 32 a [illegible] [illegible] 45

20 [illegible] 4 [illegible]
[illegible] [illegible]
15 [illegible]
10 [illegible]

~~24~~

21 [illegible] 3 [illegible] 3 [illegible]

22 [illegible] [illegible]
[illegible] 1. 2. 3. 4. 5.

21 27 [illegible] [illegible]
28 [illegible]

23 4 [illegible] No 5. 6. 7. 8.

11 25 [illegible] [illegible] Drawings

5 brackets [illegible]
Cash

***

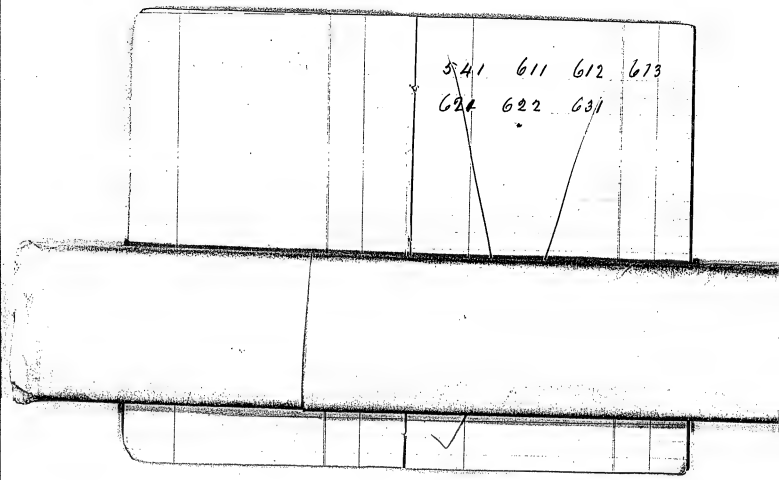
23	25 Copying Block Book 100						
"	5 Copying CB do. 6.7.8.9 10.						
	~~12 Receiving Cons~~						
	14 Founders						
Feb 17	579 Battry Erections						

Domestic Boxes

2	~~3~~	~~4~~	~~5~~	~~6~~	~~11~~
~~12~~	~~13~~	~~14~~	~~15~~	~~16~~	~~21~~
~~22~~	~~23~~	24	~~25~~	~~26~~	~~31~~
~~32~~	~~33~~	~~34~~	~~35~~	~~36~~	
~~41~~	~~42~~	~~43~~	~~44~~	~~45~~	
~~46~~	~~51~~	~~52~~	~~53~~	~~54~~	
~~55~~	~~61~~	~~62~~	~~63~~	~~64~~	
111	~~112~~	~~113~~	~~114~~		
~~115~~	~~116~~	~~121~~	122		
~~123~~	~~124~~	125	~~126~~		
~~131~~	~~132~~	~~133~~	~~134~~		

135	136	~~141~~	
142	143	144	
145	151	152	153
154	161	162	~~163~~
211	212	213	214
215	216	221	222
223	224	225	226
231	232	233	234
235	241	242	243
244	~~251~~	252	253

261	262	311	312
313	314	315	316
321	322	323	324
325	331	332	333
334	341	342	343
351	352	[redacted]	361
411	412	413	414
415	421	422	423
424	431	432	433
441	442	451	511
512	513	514	521
522	523	531	532


341 611 612 673
621 622 631

May 20 Piece Work
and other jobs

Knetzer

4 Keys for $1.25

14 Keys for 50 cts

Elassen

20 hours 25 Keys

~~26 Keys D.S.~~

Retter

60 hours shop work

Schwartz

5 hours Sundries
and poles setter at
$16.00
Fliser

6 Condensers
at $4.00 a piece

Kraft

30 hours Domestic

Schwartz

4 Plug switches
at $1.25 each

3 Domestic switch
at $2 each
and Key $2½

24 hours shop work

Waltzinger

48 binding posts
at 2 cts each 50 hours

Able

One week @ 3/h

59 hours

No 1 Bunsen

Common battery

No 1 Z 61 ~~Right~~ Left
C 85 difference 24 P

A piece of pure Zn
Z 62 Left
C 85 Rt. 23 P

A piece Cadmium
Z 61
C 85 Rt 24 P

Zn in dry side cos. well
Z 61
C 85 Rt 24 P

Cadmium + P + Zn + Platl
+ N
Z 61
C 85 24 P

2 Mat platin + N acid for solution
Thyrol. not Z.

Acetate Merc.
Z 30 4 N
C 26

Water
Z 26 2 N
C 24

Potassium
Z 0
C 0

Rhodium
Z 45
C 80 35 P

Indium
Z 57
C 80 23 P

Mercury
Z 57
C 80 23 P

Magnesium
Z
C No current

Beryll
Z 0
C 0 no current through

Osmium Iridium
Z 50
C 80 20 P

Ferrum hydrid
0 0 0

Hydrinium
Z
C

Erbium
0 0

Niobium Cerium
0 0 0 0.

Boronium
0

Barium
Z 57
C 80 23 P

Silver
Z 57
C 80 23 P

Tellurium
Z 0
C 0

Tellurium
Z 57
C 80 23 P

Magnesium
Z 57
C 80 23 P

Palladium
Z 57
C 80

Antimony
Z 57
C 80 23 P

I have put on 10 cells.

Platina & circuit

Z 75
C 100 25 P.

Ruthenium

Z 75
C 10 25 P

Cobalt

Z 75
C 100 25 P

Rhodium could not take it later fire but think it is same in

Arsenic

Z 75
10 25 P.

Selenium could get no deflection

Tallium

Z 75
C 100 25 P

Lead

Z 75
C 100 P 25

Indium

Z 75
C 100 25 P

Chromium fuse

Iridium fuse.

Z 75
C 100 25 P

Gold.

Z 75 C 100 25 P.

Tungsten

Z 75 C 100 25 P

Acetate of Ammonia

Z 73 C 100 - 27 P

Strong effervescence at positive electrode + smell of gas large quantities of gas from both poles

Carbazotic Acid

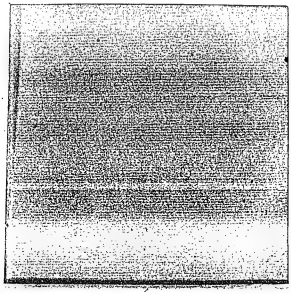
Z 73

C 99 26 P

Red color at N Electrode lots of gas.

Bichromate Potash.
Shet.

225	315	
324	313	
322	235	
314	234	
316	261	155
321	246	153
244	262	
312	261	
232	241	
233		
253		
256		



Pocket Notebook, PN-72-00-00

This undated notebook contains notes and drawings relating to telegraph printers. There are drawings by Charles Batchelor of component parts and lists of hours worked by employees on specific components. Approximately 30 pages of this unnumbered book have been used.

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FAMILY SEWING MACHINE

Can be paid for in small Monthly Installments.

181,260 Sold during the year 1871.

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No. 766 Broad St. Newark, N. J.

O.T. Hopper & Co. Gen'l Ag'ts.

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ROYAL MAIL STEAMSHIPS,

For PASSAGE

TO AND FROM

LIVERPOOL, QUEENSTOWN,

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On ENGLAND, IRELAND and SCOTLAND,

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TEAS, COFFEES, CHOICE GROCERIES,

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Principal Depot, **736** Broad St. cor. Commerce.
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Of every description.

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73 MARKET ST., near Court House.

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$450,000,00

Dividends Every Year.

CHARTERED IN 1811.

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INSURANCE COMPANY,

Office, 741 & 743 BROAD STREET,

Will Insure your House or Furniture, at the lowest cash price.

JOHN J. HENRY, Sec'ty. C. M. WOODRUFF, Pres.

1

Regraded

Boylan 5 ft

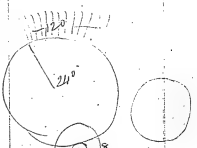
Leeden 10 ft

Mc Kay 28 ft Roller shafter & Mm shaft

Boylan 5 "

Schneider 18 ~~chaft center~~ ~~[illegible]~~

Connie 7 ~~[illegible]~~ ~~[illegible]~~

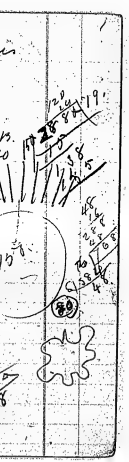


Relays

Leiden	156	[illegible]
Poplar	[illegible]	[illegible]
~~Bow~~	~~0~~	~~[illegible]~~
Chadwick	6	[illegible]
Salvin	21	[illegible]
Rodda	50	[illegible]
Lunch	10	[illegible]
Dean	63	[illegible]

Lounders

New Boy	12	[illegible]
~~Bow~~	~~2~~	~~[illegible]~~
Smith	12	[illegible]
Salvin	11	[illegible]
Pilling		[illegible] 20
Salvin		[illegible]
Parrill	10	[illegible]
Dean	24	[illegible]

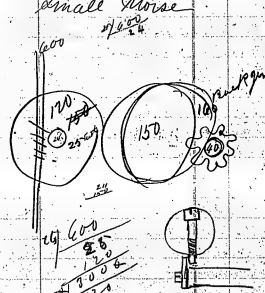


1.

Keys.

Boylan	2½ doz long screw.
Chandler	7 curved close stud
Boylan	Key Hd. 7½
"	small screw Hd 10.
Kay	Collars for key screw 10.
Chandler	Shaft 15
"	roller 10
Mr Kay	pot screws 5
	shoulder screw 10
Boylan	key screw brass 15
	small screw 5
Boylan	centre screw Hd 10
~~Gilmore~~	~~40 pot mach~~
Boylan	50, centre screw
Mr Kay	40, 8 " centre
Dudley	10 Key levers
Kay	20 Side rollers
Polley	8 Side rollers
Farrell	12 Hd pot mach

Small Morse

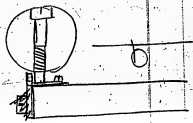


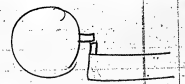
Stock Printers

Boyer — paper grade clean 75
Charish — paper fed click clean 7
Boylan — Worm 15.
" — Pad worn 15.
E. Clark — 25 Ad. mach
Linden — 50 Jam mach
Debaun — 150 h. Ass et c
Cleborne — 180 h. fm
Flemery — 15 - Rubber.
Tolman — 180, Pad worn et c
Walberg — 45 Ass P.
Gallind — 55 Ass P.
Daly — 160.
" — Jam 160
Nash h. — 140
Kirchman

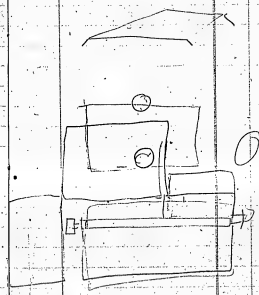
Carbon

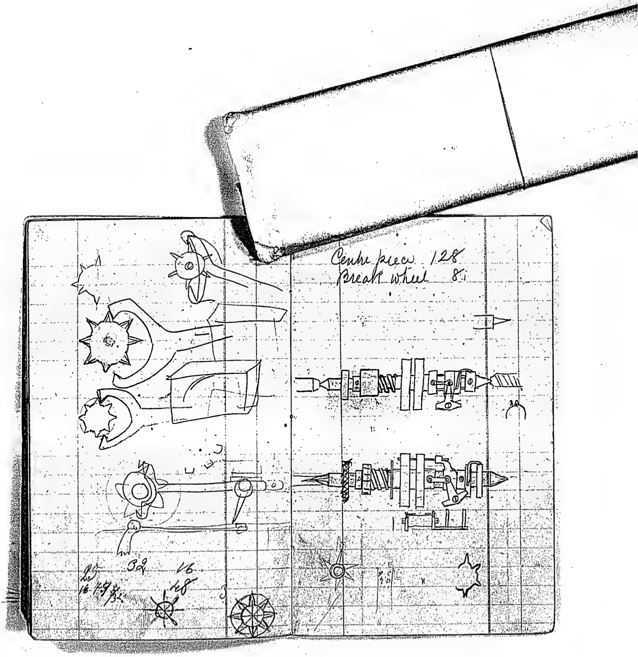
McKay Brass . . . 15.



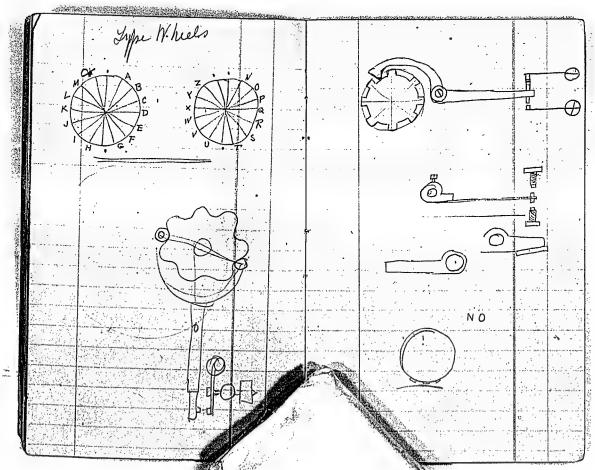


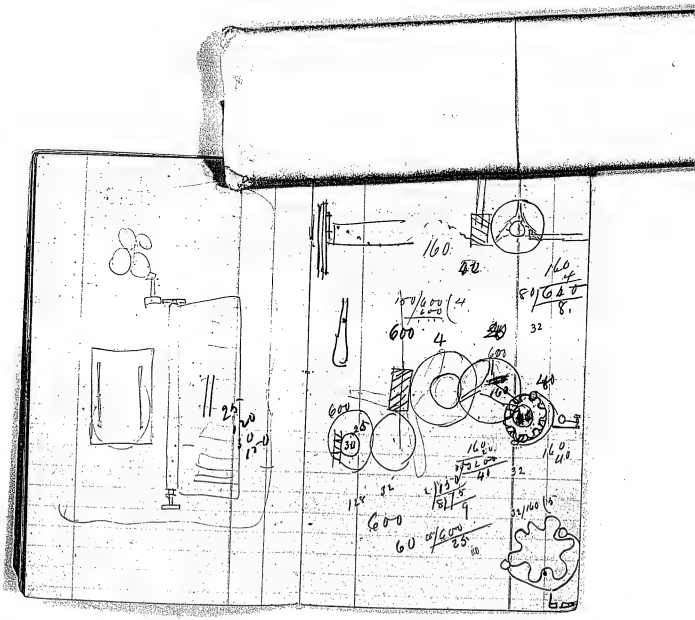
12 Key switch handle
12 Key buttons

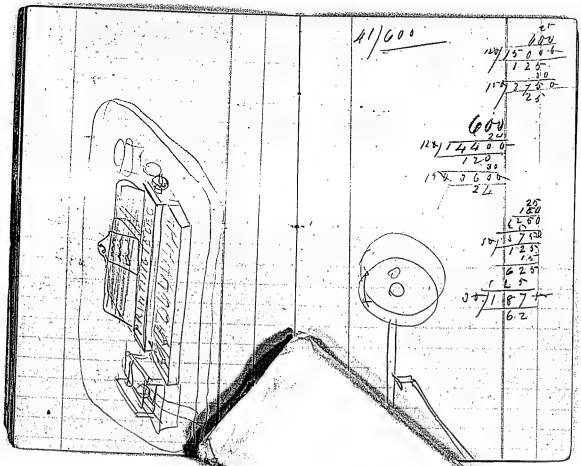


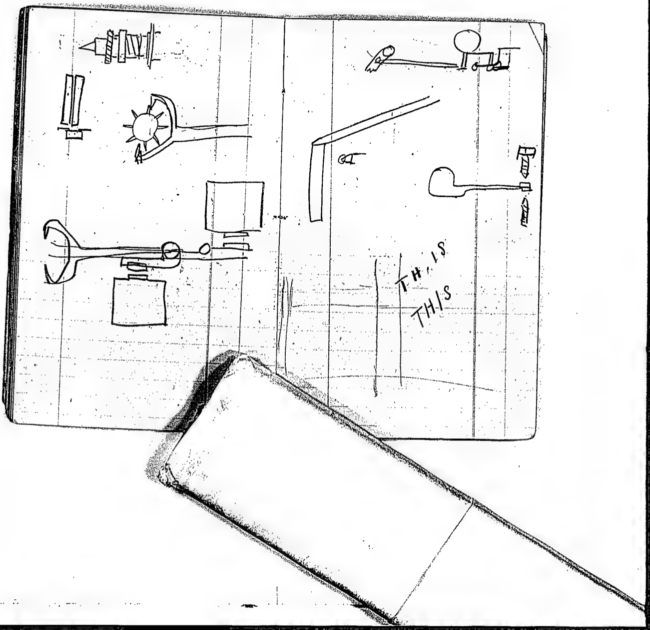


Centre piece 128
Break wheel 81


Type Wheels
NO

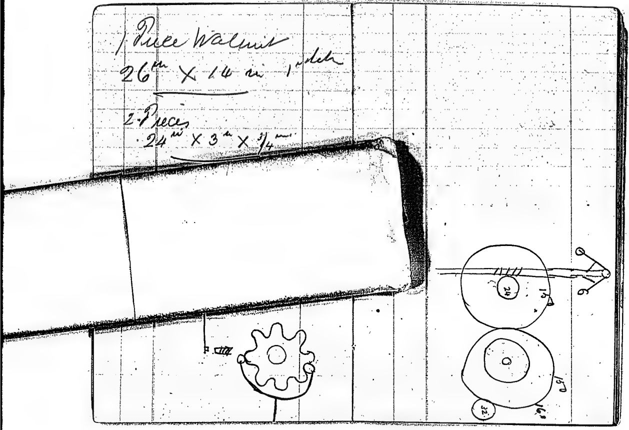






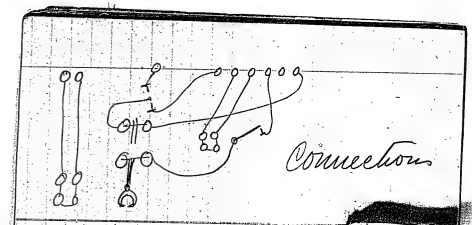
TH IS

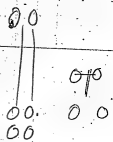
THIS



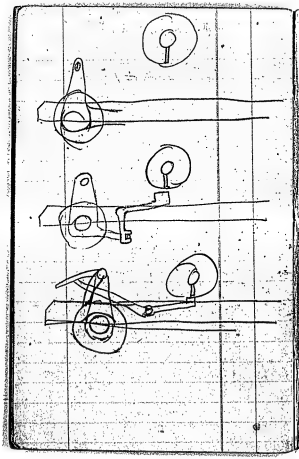
1 Piece Walnut
26in X 14 in 1 inch

2 Pieces
24in X 3in X 3/4in


Connection

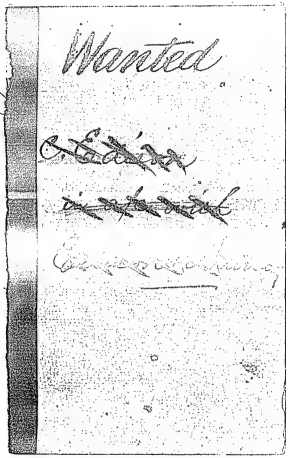


Le Cabone



Pocket Notebook, PN-75-00-00

This undated notebook by Edison and Charles Batchelor contains lists of chemicals and other materials. The cover is marked "Wanted" and the inscription "C. Edison in a/c with Edison & Murray" has been crossed out. Four pages of this unnumbered book have been used.


Wanted

PN-(75-00-00)
E-2554

Borax Glass
Charcoal
Powdered charcoal
Gasolene
Kerosene
Paraffine oil
Sulph oil
Sperm oil
Coke
Coal
✓ Feldspar
Slag
✓ Guano
✓ Superphosphate of Lime
Copper Pyrites
Lime Ore
✓ Carbon Bi sulphide
Dextrine
✓ Gum Tragacanth
✓ Gum Copal
Caoutchouc
Copal Varnish
Damar Varnish

Litmus solution Milk
Chalk ✓
~~Bicarbonate of Soda~~
~~Tallow~~
Linseed oil
Cottonseed oil
Lard
Cane sugar, brown & white
Powdered glass
~~Whiting~~
Gelatin
Egg Albumen
Blood "
~~Alum Crystals of Potassium~~
Molasses
Syrup
Castile soap
Rabbit soap
Soft soap
Japan Varnish
Red paint
Putty

Mustard
~~Jalap~~
√ Ipiacuan
√ Flax Seed
Pound Cotton,
Pitch
Dry White Lead
Putty,
Wool
Silk floss
Box blacking
Sloan Patish,
Bar lead
√ Codliver Oil
1 book goldleaf
1 " Silver
1 lb dried peas
1 " bran
Cayenne Pepper
Clover seed
√ Gamboge
√ Cinnamon
~~Licorice~~

~~Coffee~~
Tea
× Rhigolene
√ Sandarach Gum
2 oz Potassium Iodide
Tartrate of Antimony
Valate of Iron
√ Sulphate of Zinc
× Fuming Nitro acid
× Alcohol
~~Granulated Copper (Acid)~~
Penny cress seed oil
√ 2 oz Nut galls
~~Galls~~
1 lb Gutta Percha (Bishop
mixed.
~~Lime~~
Stearine

Pocket Notebook, PN-75-01-01

This undated notebook contains a list of chemicals arranged alphabetically. The cover is marked "List of Chemicals." Nineteen pages of this unnumbered book have been used.

List of Chronicals.

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H. McNALLY, Publisher, 153 and 155 Market St., Newark, N. J.

PN-(75-01-01)

A

Acid..	Acetic	B.
"	Arsenic	m.
"	Arsenious.	E. & J.
"	Anemonic	J.
"	Antimonic	m.
"	Benzoic	m.
"	Boracic	C.
"	Boric	m.
"	Camphoric	m.
"	Carbazotic	L. & m.
"	Carbolic	m.
"	Chinic	"
"	Chloric	L.
"	Chromic	K.
"	Citric	B. m.
"	Cyanuric	m.
"	Filicic	L.
"	Formic	"
"	Gallic	K.
"	Hippuric	L.

A			
Acid.	Hydrobromic.	m.	
"	Hydrochloric	L.T.F.	
"	Hydrocyanic.	I	
"	Hydro fluoric	J.	
"	Hydrojodic.	L.	
"	Hydrosilicic.	"	
"	Hypochloric.	"	
"	Iodic.	"	
"	Lactic.	"	
"	Malic.	"	
"	Molybdenic.	"	
"	Nitric	L	
"	Nitro Muriatic	D.	
"	Oleinic	L.	
"	Oxalic	M.	
"	Phosphoric (glacial)	C.	
"	Phosphorous	L	
"	Phospho Molybdic	L.	
"	" Wolframic	"	
"	Pyroligneous	D.	

A			
Acid.	Salicylicum	m.	
	Silicic	C. M. M.	
	Standard (SO_3)	B.	
	Sulpho-Methylic	L	
	Sulpho-Vinic	M.	
	Stearic	M.	
	Sulphuric	F.	
	Tartaric	D.	

A.

~~Aldehyde~~	A.
~~Antimony Chloral~~	
Acetone	n. H.
Alcohol	l.
Aldehyde	n.
Alkanet Root	a.
Aluminium Chloride	H.
Alumina	n.
Amalgam [Hg + Sn]	f.
Ammonium Arsenicate	f.
Amm: Carbonate	f. H.
Amm: Citrate of Iron	f.
Amm: Chloride	f.
Amm Copper Sulphate	f.
Amm: Iodide	n.
Amm: Molybdate	f.
Amm: Nitrate	d.
Amm: Oxalate	n.
Amm: Phosphate	f.
Amm: Urate	f.

A.

Ammonia Water	l. r. f.
Annatto	a.
Aniline	n.
Antimony Chloral	n.
" Sulphide	D. H.

B.			C.		
Barium Carbonate	G.		Cadmium Carbonate	G.	
Do Chloride	D. H.		Calcium Chloride	F. C. H.	
Do Nitrate	K.		Calcium Nitrate	G.	
Do Sulphide	L.		" Sulphate	"	
Baryta	F.		" Sulphide	K. H. C.	
Beus' Wax	D.		Camwood	G.	
Bismuth Carbonate	G.		Carbon Bisulphide	F.	
" Oxide	"		Chalk	C. M.	
Blue Flag	A.		Cobalt (common)	J.	
Bone Black	L.		Do Chloride	N.	
Brass Filings	C. M.		Do Nitrate	"	
Brazil Wood	A.		Cochineal	"	
Bromine	N.		Codeine	"	
Buck Eye	A.		Copper Arsenite	G.	
Burnt Umber	J.		" Carbonate	"	
			" Ferrocyanide	"	
			" Nitrate	"	
			" Sulphate	"	
			Cotton (Soluble	K.	

C.	
Creosote	M.
Cream of Tartar	K.
Cudbear	A.
D.	
Dextrine	B.
Dogwood	A.
Dragon Blood	"
E.	
Ether	D.

F.	
Flour	F.
Fusible Metal	M.
Fustic	A. B.
G.	
Gamboge	M.
Gold Chloride	K.
Gum Arabic	"
" Camphor	"
" Mastic	"
" Sandrach	"
" Senegal	"
Gypsum	M.
Gum Myrh	B.
" Kino	"
Glycerine	D.

H.

I

Indigo	L.
Do Sulphate	M J.
Ink [Patent]	J.
Iodine	B.
Iron by Hydrogen	J.
" Ferrocyanide	
" Oxalate	L.
" Perchloride	J.
" Peroxide	
" Pyrites	L.
" Sulphate	B.
" Sulphide	C.

J.

K.

L

Lead (Red)	C.
" Acetate	J.
" Chloride	K.
" Chromate	M.
" Iodide	M.
" Nitrate	J. M
Lime Chloride	D.
Litmus	L.
Logwood in HO	C.

M.

Madder	A.
Magenta	G.
Magnesia	M.
Magnesium Chloride	G.
" Nitrate	H.
" Phosphate	"
" Sulphate	"
Manganese Acetate	M.
" Carbonate	H.
" Peroxide	D & K
Mallows	A.
Manganese Sulphate	K.
Mercury	F & H
" Iodide	R.
" Perchloride	F.
" Proto chloride	J.
" Proto nitrate	H.
" Sulphate	H & K
" Sulphocyanide	G. M.

N.

Naphthaline	J.
Nickel	M.
" Nitrate	"
" Sulphate	"
Nitro Benzole	"

O.

Oil (olive)	D.
" (Castor)	J.

P.

Peach leaves	A.
Phosphorus	M.
Platinum (Sponge)	G.
Potassium (metal)	H.
" Acetate	J.
" Bichromate	M.
" Binoxalate	J.
" Bisulphate	H.

P.				P.			
Potassium Bitartrate	M.			Potassium Selenate	M.		
" Bromide	G. M.			" Telluride	M.		
" Chlorate	G. H.			" Antimoniate	J.		
" Chloride	J.			Pumice Powdered	L.		
" Chromate	F. H.						
" Citrate	H.						
" Cyanide	J.			Q			
" Ferrocyanide	M. M. R.			Quinine Sulphate	M.		
" Ferricyanide	M.						
" Hydrate	C. M.						
" Hyposulphite	M.			R			
" Iodide	M.						
" Nitrate	C. H.			Resin (powder)	K.		
" Nitrite	F.			Rochelle Salt	J.		
" Oxalate	J.						
" Phosphate							
" Permanganate	M.						
" Sulphate	C. M.						
" Sulphide	G. H.						
" Sulphocyanide	M.						

S.	
Saffron	A.
Schönbein's Test (Ozone)	L.
Silver. Nitrate	L.
" Ore from Utah	"
Sodium	M.
" Acetate	H. Th.
" Bisulphate	J.
" Bisulphite	"
" Carbonate	C.
" Citrate	J.
" Chlorate	H.
" Hydrate	G.
" Hyposulphite	D.
" Molybdate	G.
" Nitrate	H. Th.
" Nitroprusside	M.
" Oxalate	J.
" Phosphate	G. J. Th.
" Stannate	J.
" Sulphate	D. L.

S.	
Sodium Sulphite	C. B.
" Silicate	C. M.
" Sulphide	F.
" Tartrate	H.
" Tungstate	J.
Selenium	M.
Spelter	J.
Spermaceti	"
Starch	K.
Strontium Carbonate	G.
" Chloride	H.
" Nitrate	H. K.
" Oxalate	G.
" Oxide	"
" Sulphate	"
Strychnine	M.
Sugar (cane)	K.
Sumac	C.

T.

Tannin	C.
Tartar Emetic	J.
Tellurium	M.
" Foliated	"
" Ore	B.
Tin (granulated)	D.
" Perchloride	H.
" Protochloride	H M.
Turmeric	A. H.

U.

V.

W.

Walnut	A.

X. P

Y.

Z

Zinc (granulated)	D.
" Acetate	H.
" Carbonate	H. J.
" Nitrate	H.
" Sulphate	J. K.
" White	K.

A Note on the Sources

The pages which were microfilmed for this collection are in generally good condition in the original. There are some pages, however, which due to age are lighter than normal. Additionally, because some volumes are very large and have been bound tightly and cannot be unbound, there are intermittent occurrences of slight distortion of the edges of a small percentage of the pages. We have made every technical effort to ensure complete legibility of each and every page.

END

6

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